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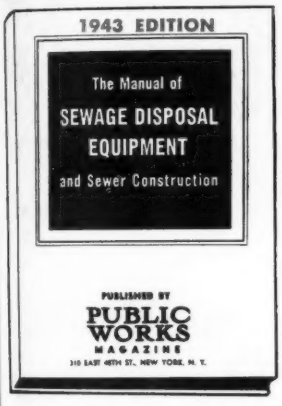

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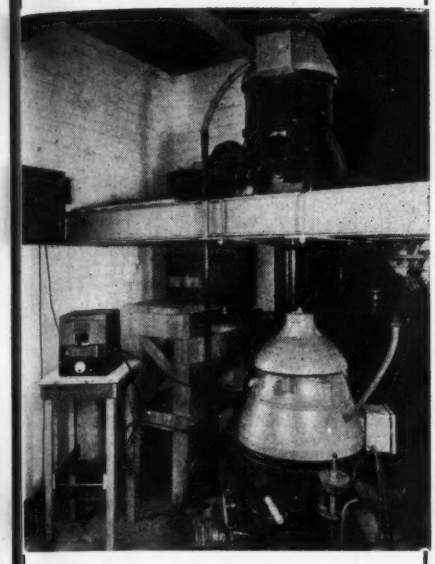

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Vol. 74 No. 11

A. PRESCOTT FOLWELL, Editor

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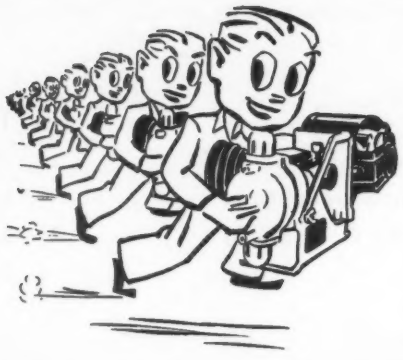

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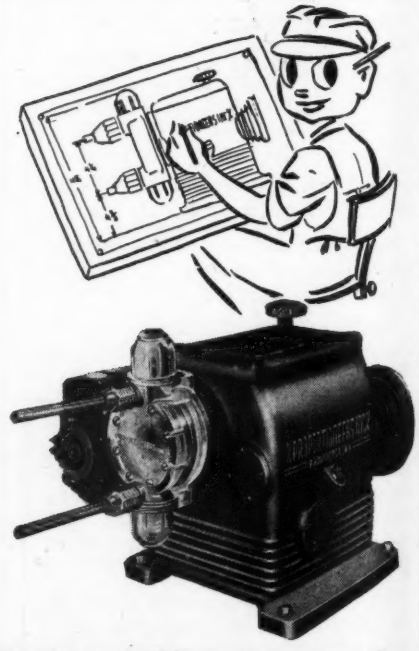

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When you need special information—consult the classified READER'S SERVICE DEPT., *pages 54-57*

THE WAR EMERGENCY

WPB To Sewage Plant Operators

In an address October 22 before the Federation of Sewage Works Associations, Maury Maverick, Director of the Government Div., WPB said that, in spite of more favorable conditions both at home and abroad, "we must continue to limit our construction, operation and maintenance activities to those which meet minimum civilian requirements. . . . There is now a little more aluminum and copper for civilian needs. There is more cast iron in the form of pipe and sewerage accessories; but lumber is more critical than ever." Manufacturers of all sewer cleaning equipment and sewage treatment machinery "must get their metal under the controlled materials plan from the Government Division. . . . We have been taking care of them since July 1. We have been able to allow a little increase in their production. We believe that they will be able to produce materials which will take care of all your legitimate requirements."

"I wish to encourage *postwar planning*. Projects which may not show the necessary elements of essentiality at this time and for which priority assistance may not be granted by WPB may, and probably do, have all the essentials of good, sound immediate postwar construction, and I encourage you to test your projects—both as to essentiality now and importance for postwar planning—and to conceive and design those projects which, in less strenuous times, besides being essential to civilian needs, will merit and receive public support. In this connection I invite you to make full use of the facilities offered by the Sewerage and Sanitation Branch of the Government Division. Your problems will be promptly and conscientiously considered—each upon its own merits; but if you do not receive a response as quickly as seems desirable, remember that ours is a large agency which receives thousands of applications daily, all of which must be read, recorded, routed, and acted upon in accordance with the law. This takes time, but we'll hurry it along as fast as is consistent with the importance of the query."

WPB Regulations Concerning Sewer Pipe

WPB on September 25 issued Limitation Order L-316, saying "The fulfillment of requirements for the defense of the United States has created or will create a shortage of facilities used in the production of vitrified clay pipe for defense, for private account and for export; and the following order is deemed necessary and appropriate in the public interest and to promote the national defense."

This order defines permissible vitrified clay sewer pipe items which may be manufactured after October 25, 1943. The Order divides the country into three zones: Zone 1 refers to all of the country east of the states of Washington and California, Zone 2 covers California south of the 36th parallel of latitude, and Zone 3 refers to the state of Washington and all of California north of the 36th parallel.

Hereafter, all production of clay sewer pipe must conform to U. S. Specification SS-P-361a, with fittings and appurtenances in accordance with a prescribed schedule of sizes and types. In Zones 2 and 3 (Washington and California), the standards are slightly different than for the remainder of the country. U. S. Specification SS-P-361a covers both "standard" and "extra strength" pipe. Standard pipe, as specified, is practically identical with conventional double strength clay pipe, usually specified by reference to A.S.T.M. standards: Designation C-13-40.

Incidentally, the Order itself is a sort of uniform catalogue of clay pipe products giving details of each permitted item.

It is still legal to produce items not on the prescribed list provided they are necessary for filling orders placed before September 25, 1943, or are needed to make possible the sale of remainders of such items.

WPB To Water Works Men

Arthur E. Gorman, Director, Water Div. of the WPB, speaking before the New England Water Works Association on September 29, said: "Steel and copper are still tight, with no relief in sight. . . . Major water improvements in critical areas are still going forward to meet extraordinary demands of war industries."

"There is clear evidence that many water utilities are not taking advantage of the provision of U-1 Order to maintain plant. Altogether too many water utility operators are submitting applications to Washington for work already permitted under the U-1 Order. The recently announced U-1-f amendment makes it unnecessary to obtain permission for extensions to certain consumer premises where the net cost of material is less than $1,500. You will be pleased to learn that this amendment has just been revised removing the 100-pound pressure limitation in the use of steel service pipe and increasing the weights of cast-iron pipe which may be used for extensions to serve consumers. Under the amendment any kind of pipe except copper may be used for services. This is to make it possible to maintain sound minimum practice in installing water pipe of adequate size so that service for fire protection may not be hampered. Earlier in the period of the war when cast-iron pipe was tighter, it was necessary to place very close limitations on pipe sizes for such connections.

"The potential hazard to war production, should water utilities be faced with operations during a prolonged drought, is a serious one. Every water utility should appraise its plant to determine points of vulnerability in case of drought and plan what special priority actions should be taken to obtain necessary materials and equipment."

"The OWU is organized to serve you. Its Water Division is anxious to know your wartime problems and to help in any way possible in meeting war production and essential military and civilian needs."

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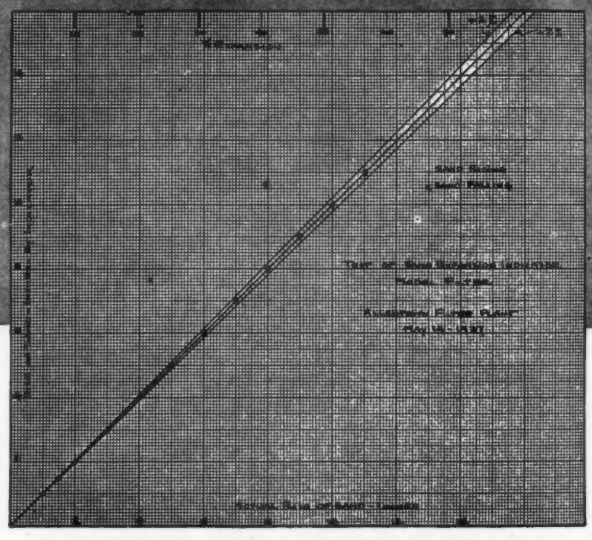

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VOL. 74. NO. 11

Drainage and Embankment of Glenway Avenue at Carson Avenue, Cincinnati

By H. H. KRANZ
City Engineer, Cincinnati, Ohio

H. H. Kranz, City Engineer

A street fill moved down the ravine it crossed because drainage had not been provided and the foundation of the retaining wall was inadequate. How these defects were remedied is described.

GLENWAY AVENUE in the neighborhood of Carson avenue, Cincinnati, Ohio, was constructed on a fill, which fill began sliding about thirty years ago. Finally, in May, 1942, a major slide occurred that necessitated radical repairs. The purpose of this study is to show why the fill has moved, why the retaining wall at the north property line of Glenway avenue did not stabilize the street, and what remedial measures were taken to effect stability.

First, let us consider a brief historical sketch.

The oldest records on hand, dated 1873, indicate a valley to the north of Glenway avenue extending down-stream from Carson avenue approximately parallel to and about 80 feet from the north line of Glenway Avenue. Up-stream from Carson avenue the valley divides into three forks: west, southwest and south, which are about 700 feet, 1,000 feet and 400 feet long, respectively. We shall concern ourselves principally with the two latter ones.

Just prior to 1910, Glenway avenue at Carson avenue provided only one wagon lane, it being near the present south curb, founded upon a fill placed in 1856. The north portion was subject to sliding. In 1910 the street was improved with granite block pavement 40 feet wide between curbs, necessitating some additional fill, particularly along the north side of the street. As a part of the street improvement (but under a supplementary agreement), a reinforced concrete counterforted wall, supported on cast-in-place piles, was constructed along the north property line of Glenway avenue. In 1913 precast reinforced concrete sheet piles were driven along the south edge of the wall footing to hold the street fill, which was sliding under the wall.

It seems that the wall started to move soon after it had been constructed. Cracks developed. Frequent street patching was resorted to. Of late years field measurements were taken of the movement of the wall, which was both outward and downward. Near the west line of Carson avenue, the point of maximum movement, a major rupture took place. The wall had been underpinned with wood cribbing at this point in April, 1942, but, on May 8, following a wet spell, the wall failed, many of the piles having sheared off. As long as the wall could be held in an upright position it could still be counted upon to give a certain measure of support to Glenway avenue; therefore about 150 lineal feet of the wall, which remained upright, was underpinned with wood cribbing.

On May 8 the pressures in the 6-inch and 10-inch water mains which ran through Glenway avenue were reduced. On May 11 the 6-inch line was dead-ended near both ends of the wall and the 10-inch main was relaid just south of the south curb. On this day traffic was routed over several streets to the south, but on May 12 it was considered safe to restore normal two-way traffic over the south half of the roadway.

Why did the street move? Glenway avenue at Carson avenue moved primarily because the street fill dammed the two natural ravines, namely: the southwest and the south forks mentioned above. No effective escapement of the water was provided. In addition to the water from the two forks which was seeking its passage through the fill, we could well expect to find water following each of the underground lines —the water and gas mains, the sewers, the telephone ducts. Such condition does exist, at least in part, because the ground excavated for the rerouted water

Displacement of sidewalk caused by slide.

main was all quite moist, except that in the east or downhill street crossing, which was very dry.

Why did not the retaining wall stabilize the street? Since the owners in 1910 of the property north of Glenway avenue between Carson and Wessels avenues were opposed to an extensive fill because of interference with their mushroom farm, a reinforced concrete wall was constructed. In the light of engineering, several mistakes were made in connection with the construction of the wall. While the wall section itself was well designed, the footing was not carried to a low enough elevation, and it was founded upon reinforced concrete piles which were driven only into the fill of 1856 —they did not, except at the ends of the wall, extend into natural ground formations. Also, the connection between the piles and the base of the wall was weak, shear failure taking place at this plane. Symptoms of ill design must have manifested themselves early, since in 1913 the concrete sheet piles were driven. Ever since initial movement of the wall took place, surface water must have entered through cracks in the street pavement, in spite of roadway repairs, aggravating the load against the wall.

The remedial measures taken

Glenway avenue pavement could have been restored by building a hillside viaduct founded upon piling, which in normal times would cost about $30,000 but this would have to be delayed because of the war. Or the improvement could consist of constructing a pavement on a stabilized sub-base and replacing the wall with an embankment, costing about $15,000.

The latter scheme was carried out.

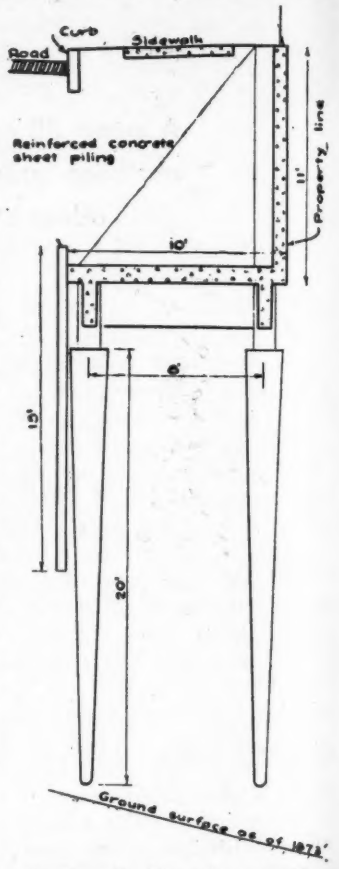
While at first glance there seem to be various contributing factors to the failure of the street at Glenway and Carson avenues, there was actually one basic reason, namely water.

We have endeavored to integrate all sources of water into an effective drainage system; have placed a 2:1 stone-shale-clay fill north of and adjacent to Glenway avenue; have removed the wall, except the east and west stable portions; and have reconstructed the street pavement. These steps are given more in detail below.

There were no drawings on hand showing any drains in the old valleys crossing Glenway avenue. The records of the existing newer drains were augmented by consulting old residents and by digging test pits. The pits, together with cored test holes, furnished sub-surface data.

The base of the fill must be well drained; therefore considerable exploring had to be done in the lower valley so that drainage could be provided before the filling operations were started. An 18″ vitrified pipe, conducting a fairly constant flow of water, was found partly exposed, terminating at point Z.* Here the water soaked into the ground and was lost. The exposed part of the pipe was converted into a french drain and was connected to manhole A. At test pit (1) the same 18″ pipe carrying water was located, whereupon the 21″ concrete pipe was constructed from A to B to replace the existing 15″ pipe, the depth at B being lowered based on the elevation of the 18″ pipe in the test pit. The lower half of the pipe was bedded on concrete, the upper half was covered with coarse gravel. The same type of construction was used for the 12″ concrete pipe extending from B to D. At pit (3) a dry rubble wall was exposed, also a brick manhole with no inlet but an 18″ outlet pipe leading to pit (1). At the bottom of the wall there was the same stream as at pit (1). The first few lengths of the outlet pipe were dry. At pits (2) and (4) no water nor pipe was found. At pit (12) the dry rubble wall was uncovered; at its base was the same flow as at pit (3), but there was no pipe. Pit (5) was dry. Pit (14) was wet. No drains were found at the latter two pits.

On the south side of Glenway avenue at Nos. 3635, 3637 and 3643 various pits were dug to locate drains and stream bed. Pit (7) was dry. In the cellar near pit (6) is a cesspool that drains very tardily. The owner claimed it was connected to an *old* sewer in the filled ravine under Glenway avenue. In the attempt to locate this connection pit (6) was dug. It was found that the two downspouts were connected to the *new* sewer in Glenway avenue. The remains of the 6″ pipe, formerly connected to the *old* ravine sewer, was uncovered, leading to pit (8), thence to pit (9). No pipe was found in pit (10). The 6″ pipe was found near the surface in pit (11) pointing vertically. In the northwest corner of the same pit was found a dry rubble manhole, the top of which was 3 feet below the surface. At 26 feet below yard level was found an 18″ vitrified pipe drain which was rodded 180 feet northeastwardly. The pipe was dry except for some standing water about 50 feet northeastwardly. Water was run into the manhole from a fire hydrant and it immediately splashed into pit (4), the end of the 18″ pipe being just 8″ south of the back of the sheeting in pit (4). Pit (13) was dug to further investigate the condition of the 18″ pipe. Many of the sections of the pipe were cracked, but the alignment was very good. From pit (11) a shallow 18″ vitrified pipe extends southwestwardly. Water continually drips into pit (11) from all sides.



Section of old wall at north property line, Carson Ave.

The 8″ concrete pipe courses B-(12) and B-(13)

*See map on page 32.

Carson Ave. slide looking south from ravine, July 11, 1942.

were laid on concrete and were covered with gravel. An 8″ steel spiral weld pipe, coated inside and outside with asphalt emulsion, was threaded through the 18″ pipe from (13) to (11). The space between the two pipes was pumped full with a cement-loam-water mixture.

Pit (15) was dug in the present low point of the upper ravine. About 5 feet below the surface the old top soil plane dipped northwardly and so pit (16) was dug only to find the top soil there too sloped northwardly. In pit (17) the top soil was nearly level but deeper than in (15) and (16). In (18) fill material extended to strata. This then is the bed of the old ravine. No free water collected in pit (15). A little showed in pit (16). About 6-foot maximum depth of water stood in pit (17) at which time the gage read 8 feet in pit (18). Right from the start water showed in pits (17) and (18). Water continued to rise in the pits up to 4 days following rainfall, proving that ground water and not surface water accounted for the increase.

Pits (15) to (18) were pumped out and cleaned after standing about six weeks from the time they were dug. The earth between the pits was tunneled out. About half way between (16) and (17) a spring was found running at right angles to the proposed drain, and between two strata of limestone. A color test proved this to be the same stream that had been tapped at (12).

Carson Ave. slide looking south from ravine, June 19, 1943.

The next step was to connect (18), (17), (16) and (15) with (11). This was done by placing 8″ pipe from (18) to (15), and 12″ concrete pipe from (15) to C and from C to (11). In all cases the pipe was bedded on concrete and was covered with gravel, except that from (18) to (15) the joints were bedded on gravel. Manholes were constructed at (15) C, and 11.

Cross drains were constructed between curbs on Glenway avenue at Ridlen avenue and on Carson avenue about 100 feet south of Glenway avenue in order to intercept all longitudinal trenches and connect them with the sewer. Each of these four drains was bedded on concrete and was covered with gravel.

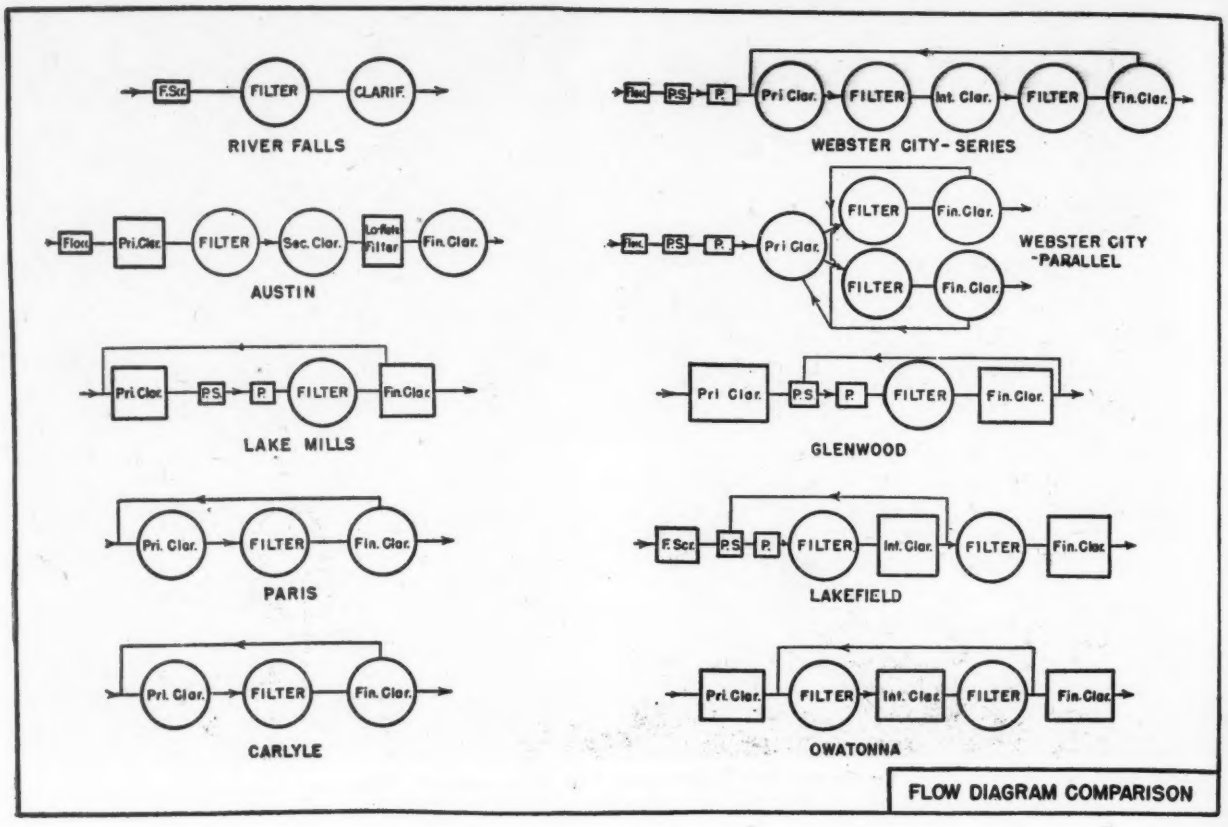
When the drainage work was well under way the 2:1 sloping embankment was started. By the time the grading was about 75% finished the old picket fence and concrete wall were removed. Top soil was placed on the completed fill and then Lonicera Halleana (honeysuckle) was planted.

Granite curbing and bituminous concrete pavement completed the improvement.

In performing this work the following equipment was used: Thew Shovel Company, Lorain, Model 40, ¾ yard moto-crane and demolition weight; American Hoist and Derrick Company 1 yard shovel; Galion Iron Works and Manufacturing Company 10-ton roller; Schacht and Biederman 4 c.y. dump trucks; Schramm, Inc., 240 c.f. air compressor; Novo Engine Company 4″ water pump; Knickerbocker Manufacturing Company 5-S concrete mixer; Allis-Chalmers Manufacturing Company 50 H.P. bulldozer; and International Harvester Company 40 H.P. tractor.

The core drilling was done by the H. C. Nutting Company.

(Continued on page 26)



High Daily Rate Trickling Filter Performance

The Health Commissioners of the Upper Mississippi River Basin investigated nine high-capacity filters to obtain data on which to base requirements and approval of plans for such filters.

AN investigation of nine different sewage treatment plants utilizing the high-capacity type of filter was made over a one-year period by engineers representing the health commissioners of the upper Mississippi River Basin. The plants investigated were: Glenwood City and River Falls, Wisc.; Owatonna, Lakefield and Austin, Minn.; Lake Mills and Webster City, Iowa; and Paris and Carlyle, Ill. Austin is the only one of these having more than 10,000 population. Nearly all the plants received some industrial waste, as creamery, poultry or canning; Austin treats considerable packing waste. The purpose of the investigation was to obtain factual data on which to base requirements and approve plans for such filters. The full report is published as a pamphlet of 136 pages, issued by the Board of Health Commissioners, Upper Mississippi River Basin Sanitation Agreement.

The work started in June, 1941, and continued for 12 months. In all, 57 24-hour tests were run. In a number of cases special 4-hour tests of maximum loadings were carried on simultaneously with the 24-hour tests. Samples were collected at approximately 30-minute intervals, and composited in accordance with the flow volume of the preceding 30 minutes. Samples were iced during the period required for collection, a temperature of 2° to 6° C being normally maintained. B.O.D. determinations were set up immediately upon completion of the composite. Analytical methods, in general, were in accordance with *Standard Methods.*

Single Stage Treatment.—The tests indicated that single-stage plants operating under normal conditions gave an overall B.O.D. reduction of 74.7% to 86.0% and averaged 79.4% for a 24-hour period. During the 4-hour peak-strength loads, when raw sewage B.O.D. was higher, the per cent of B.O.D. removal was increased but not generally enough to compensate for the stronger sewage handled. A maximum per cent of removal appears to be encountered when the filter loading is slightly less than 1 pound of raw sewage B.O.D. per square foot per day.

Two of the plants use fine screens in place of primary clarifiers, one of which performed fairly well, the other poorly, the difference appearing to be that

(Continued on page 28)

Constructing an Aerator of Non-Critical Materials

By T. H. SAUTER
City Engineer, Cuyahoga Falls, Ohio

Being unable to obtain early delivery of a metal aerator, the city built one, described herein, using oak and cypress for all but the screen plates, which were of stock galvanized perforated sheets.

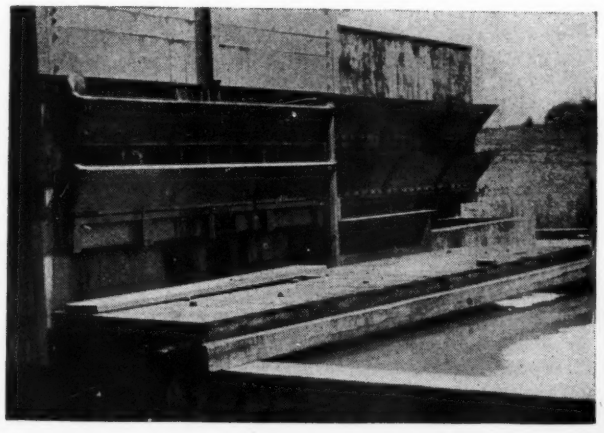
THE City of Cuyahoga Falls, Ohio, reconstructed its water treatment plant in 1935-36 as a W.P.A. project by adding an aerator, a settling basin, two filters and four softening basins. Included also in the project was the construction of a new treament plant building.

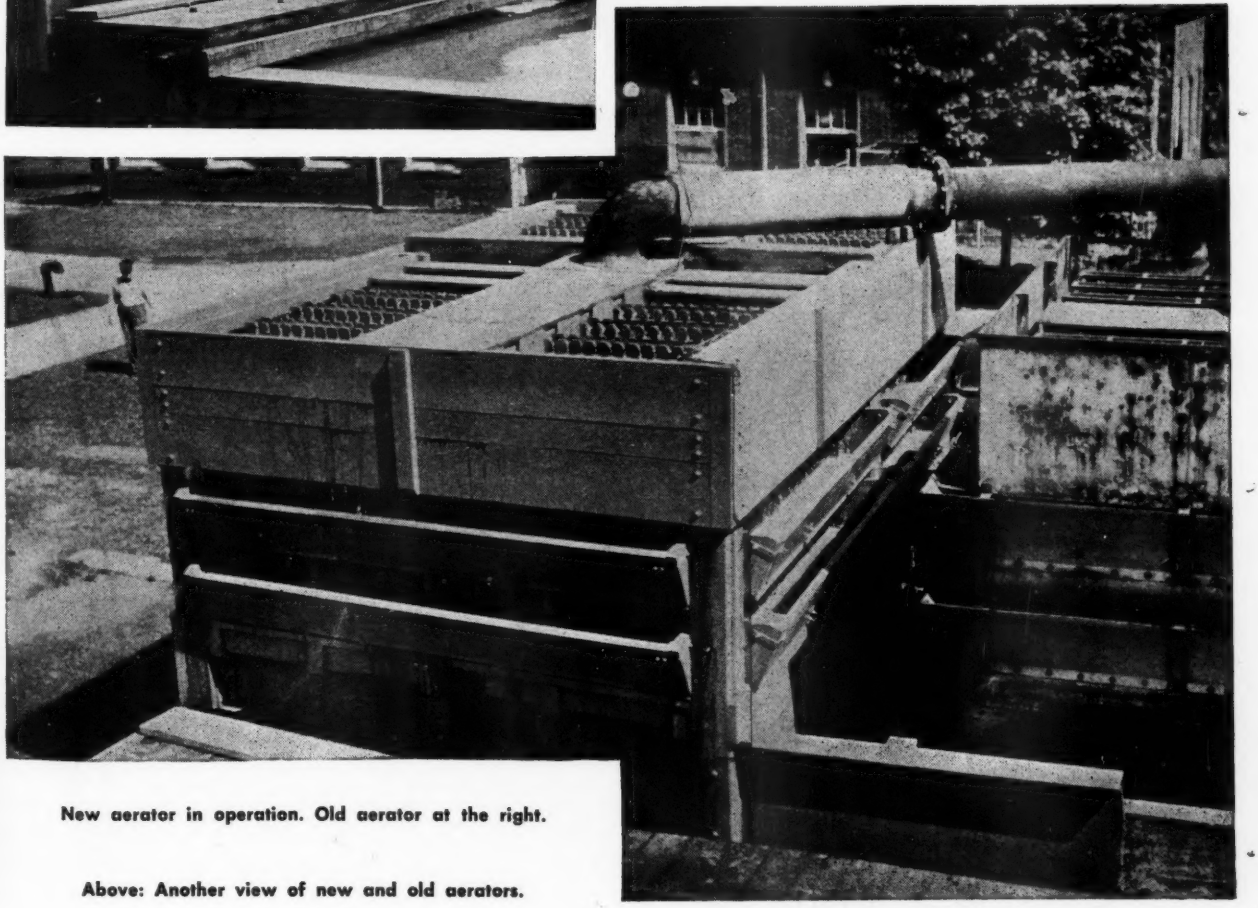
The metal aerator which was constructed at that time has been in operation continuously twenty-four hours a day, without having a standby unit—consequently it has been impossible to make any repairs to it during that period of time. Because of our inability to effect the needed maintenance, the aerator and the concrete structure supporting it had deteriorated to such an extent during the past winter that it became necessary to make immediate repairs in order to preserve it.

We were granted an AA-3 rating for this project, but since the use of critical materials would be involved in constructing another aerator of the existing type, the various manufacturers of such devices could not promise any satisfactory date of delivery or even of securing the steel required to begin construction.

It therefore became necessary for us to consider substitute materials. After investigation of market conditions in regard to securing materials, we found that we could secure stock sizes of 11 ga. galvanized perforated sheets, 4 x 10 feet, on our AA-3 rating. Such sheets with perforations near enough to our

(Continued on page 26)





New aerator in operation. Old aerator at the right.

Above: Another view of new and old aerators.

Building a Timb

Courtesy Armco Drainage Products Ass'n.

Sample of road over which bridge materials were hauled.

THE Alaska Highway crosses the Sikanni Chief river 164 miles from the beginning of the highway at Dawson Creek. The river at the bridge site is a rapidly flowing stream with a winding channel roughly 200 ft. wide. During the winter it freezes solid from shore to shore except for a narrow flow in the main channel about 6 ft. deep covered with about 3½ ft. of ice. Approaching the bridge from the south, the road drops into the valley on a steep gradient and enters the bridge on a 30° curve. The bridge is skewed 30° up stream, and the road leaves the bridge on a 15° curve. The north bank is low—is flooded occasionally—and the road crosses it on a fill. To lessen the height of this and the depth of the cut on the south bank, the bridge is constructed on a 3% grade.

The bridge consists of three 144 ft. spans, with a 3-bent pile trestle for one approach and a 5-bent for the other. The two river piers, Nos. 2 and 3, are protected by ice breakers of 4 x 10-in. sheathing. The roadway is 24 ft. wide; is 40 ft. above high water at mid-

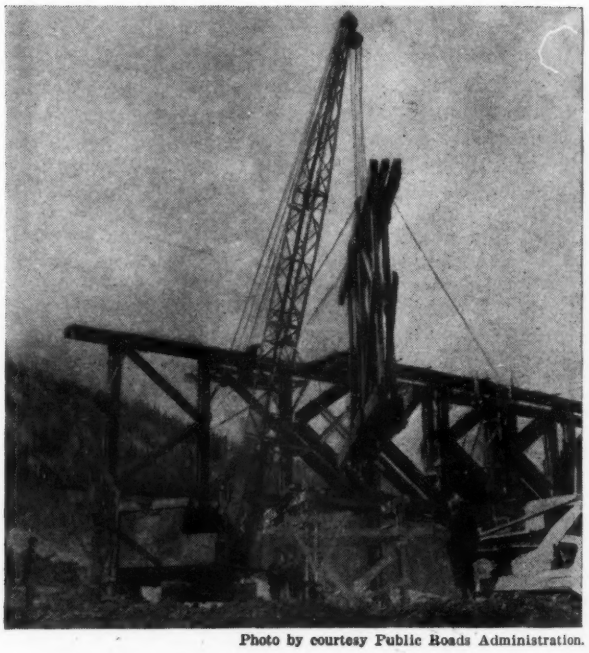


Photo by courtesy Public Roads Administration.

Assembled section of a treated truss being lifted into position.

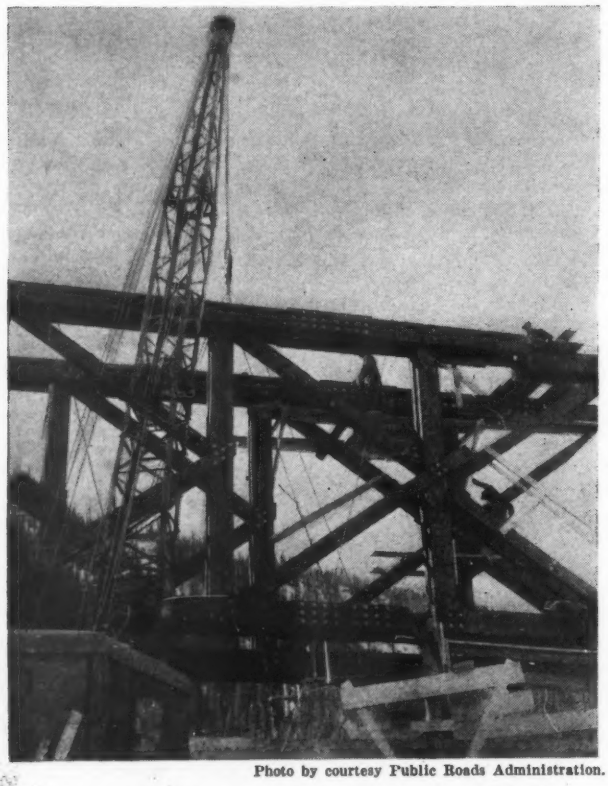


Photo by courtesy Public Roads Administration.

Assembled section being lowered into place.

stream. Each span consists of four deck K trusses 24 ft. deep, of treated Douglas fir timber framed with split-ring connectors. Piers Nos. 2 and 3 consist of 25 piles each, and Nos. 1 and 4 of 16 piles. The piles were native spruce, 40 to 65 ft. long with butt diameters of 12 to 20 inches, driven to refusal.

The fir for the trusses was brought from Oregon, being treated with a 50-50 mixture of creosote and petroleum oil before shipment. The spruce piles were trucked 56 miles over the road to the bridge site, where they were peeled and mop-treated with sodium fluoride at the rate of 21 lb. per M.B.F. After November, 1942, temperatures varied from zero to 20° below and the piles had to be thawed out before peeling and sheltered during treatment. Tests made in April, 1943 showed an effective penetration of sodium fluoride to a depth of about ¾ inch. Bracing was of creosote-treated Douglas fir from Oregon.

In driving the piles, there was difficulty in holding them to line in some places, due to shale rock slabs under ground. Under pier No. 3 a mass of granite boulders 6"to 18" in diameter had to be removed before the piles could be driven. During December, when the temperature varied between 20° and 30° below zero, the ground had to be loosened by blasting before driving was started.

nbuss Bridge on the Alaska Highway

A timber truss bridge with a total length of 584 feet built in 23 weeks, a large part of the time at sub-zero temperature, using material trucked 60 to 164 miles.

Photo by courtesy Public Roads Administration.

Bridge under construction across Sikanni Chief river. Temporary army bridge at the right.

The trusses were fabricated on the ice in quarter sections, which weighed about 9 tons, and pulled to a crane which raised them and swung them into position on the false work. When each section had been lowered into position it was held by the crane until the splice blocks of the top and bottom chords had been bolted in place. Some difficulty was experienced by warped members, and occasional failure of seats for the ring connectors to coincide. To facilitate bolting of the large splices in the bottom and top chords, four clamps were used, each consisting of two white oak blocks 6" x 6" x 36", drilled at each end for a 1½" bolt 5 ft. long. These were drawn up tight around the splice to permit starting the nuts on the splice bolts. The erecting gangs worked in two 11-hour shifts, the night shift fabricating the sections and the day shift erecting them.

The flooring of the approaches was of laminated 2" x 6" native spruce from a mill 140 miles away, supplied in 26 ft. lengths, with tapered pieces for the curved approach. The truss spans were floored with 3" x 6" creosoted fir in 10 ft. and 16 ft. lengths from Oregon. Native timber decking was dipped in a fluoride salt solution at the site. The aim was to obtain a retention of ¼ lb. per cu. ft., but the salt penetrated only ⅛ inch, and a supplementary treatment was applied with a mop just before the flooring was laid. Fire walls were built at piers 3 and 4 and two others in the approaches.

Surveying and staking out the approaches and piers began in October 1942, plans being prepared in the office of the Public Roads Administration at Fort St. John. The first pile was driven on Nov. 19, and Dec. 19 the last of the piles for the approach bents were driven. Piles for the piers were driven between Nov. 25 and Dec. 30. Aligning the piles, cutting them to grade etc., and erecting falsework were continued during January and February. Material for the superstructure was all on hand by Febr. 28 except one carload of bearing blocks and grills, which did not arrive until March 16. Erecting started next day with two 11-hour shifts, and truss erection was completed April 13. The last of the decking was spiked in place and running plank laid on the night of April 19; and by April 25, the day of the official opening, the bridge was complete in every detail, except for the last coat

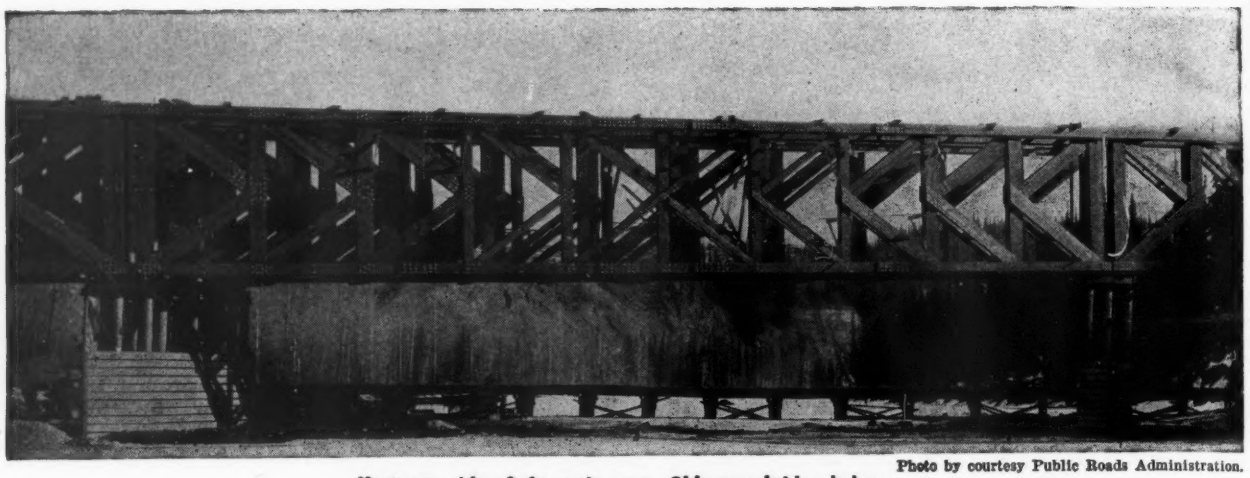


Photo by courtesy Public Roads Administration.

Upstream side of the main span. Old army bridge below.

of white paint on the handrails and wheel guards. The actual time used in constructing the superstructure was 32 days. The total time elapsed from the driving of the first pile to final completion was 23 weeks.

Pederson Brothers, Inc. of Montevideo, Minnesota, had the contract for the entire bridge job.

The materials used included 6,535 lin. ft. of treated piling, 491,824 f.b.m. of creosoted fir timber, 14,180 f.b.m of treated spruce timber, 15,618 f.b.m. of untreated fir timber, 25,040 f.b.m. of untreated spruce timber (a total of 546,662 f.b.m. of timber), and 88,660 lb. of hardware.

For the above information and the illustrations we are indebted to S. W. Powell, Resident Engineer, Public Roads Administration.

Service Charges for Use of Sewer Systems

Under a statute relating to rates payable to a city for the use of its sanitary system (Alabama Code 1940, Tit. 37, §326), cities may adopt ordinances and make charges thereunder for the use of a sanitary system constructed at the general expense of the city. The distinction between such a service charge and the cost of the connection to the system is that the service charge is for the daily use of the system, payable by the one who uses it unless the contrary is clearly expressed, whereas the cost of connection occurs but once, at the time of making the connection. The latter is in the nature of a permanent fixture and is a feature of the premises.

Unless a city ordinance making a sewer service charge is clear to the contrary, such a service charge, being for the use of the sewer, falls on the tenant making use of the service; the cost of connection falls on the owner of the premises, making a permanent improvement to them.

Under a city ordinance requiring property owners to make physical connection with the city sewer system, the owner would not be liable for a service charge imposed thereby which is for the use of the system by the tenant, where the property and facilities are used by a tenant and not by the owner. But an amendment to such an ordinance may make the owner expressly liable for such charges even though he does not occupy the property or use the facilities, if he allows the property and fixtures to be and remain connected with the sewer system. That does not mean that the tenant would not be liable also. (City of Leeds v. Avram, Alabama Supreme Court, 14 So. 2d 728.)

Photo by courtesy Public Roads Administration.

Looking north along the upstream side of the completed bridge.

All's Well That Ends Well

By CHARLES W. HIRCOCK
Superintendent of Water and Sewerage, Glendale, Ariz.

How the yield of a deep well was changed from a quality that was very unsatisfactory to a most satisfactory one.

GLENDALE, ARIZ., had a 16-inch well 1,000 ft. deep which delivered an exceptionally good quality of clear, good-tasting water; but increased consumption made another well necessary, and on August 4, 1941, one was completed 700 ft. deep, with 696 ft. of 20-inch 10-gauge double stovepipe casing, perforated from 275 ft. to the bottom with 5 cuts to each round and rounds 2 ft. apart. This well produced 1,150 gpm for 24 hrs. with a maximum lift of 102 ft.

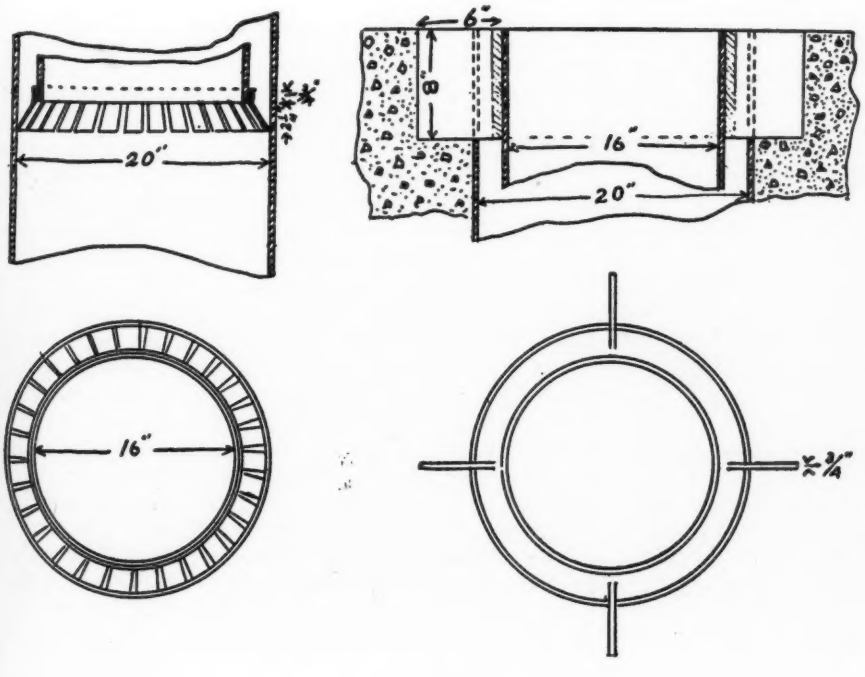
This well was not placed in service for 10 or 11 months after it had been drilled, and then complaints from consumers poured in. Some presented to the City Council physicians' opinions that the water caused a variety of physical ailments, from colds to heart pains, stomach, kidney and bladder trouble; and Council ordered discontinuance of the use of this well. The water was analyzed by the Arizona Testing Laboratories with the following result:

Total soluble salts	772.6 P.P.M.
Silica	10.0 P.P.M.
Iron oxide and alumina	0.5 P.P.M.
Calcium	90.0 P.P.M.
Magnesium	33.7 P.P.M.
Alkalies—as sodium	109.9 P.P.M.
Bicarbonates	197.6 P.P.M.
Chlorides	240.0 P.P.M.
Sulphates	83.7 P.P.M.
Calcium hardness $CaCO_3$	224.8 P.P.M.
Magnesium hardness $CaCO_3$	138.7 P.P.M.
Total hardness	363.5 P.P.M.

It seemed probable that the main portion of the undesirable water was coming from the upper part of the well, and the Council employed a driller to take such measures as he thought necessary to keep this water out of the well. He advised inserting a 16″ pipe in the top 415 ft. of the 20″ well casing and making a tight joint between the bottom of this pipe and the casing, to shut out the ground water entering the casing above this point. Because of priorities, we bought second-hand heavy oil well casing; then waited two or three months for permission from Washington to proceed with the work.

The driller used a medium size Armstrong drill rig on the job. As the 415 ft. of pipe weighed 12 to 14 tons, he drove a wooden plug in the bottom of it, which caused it to float—in fact we had to put a large amount of water inside the pipe to make it sink. At the bottom of the line of pipe was welded a funnel-shaped collar, large end down, and above this was fastened 4½ yds. of cotton ducking, part of it cut into ribbons, which was supposed to fill the space between the two casings. At each coupling, as the inner casing settled, we welded spacing irons to hold the 16″ casing in the center of the 20″ casing. When the 16″ casing had been lowered to place, sufficient sand was poured into the space between the casings to fill it 18″ deep. Then the plug was removed from the bottom of the 16″

(Continued on page 24)



At left: Funnel-shaped collar on bottom of 16″ pipe. Made of two strips of iron, each 3″ wide and 25″ long and rolled into a semicircle. Then slots 2¼″ deep were cut into one edge at 2″ intervals. The unslotted ¾″ was welded to the bottom of the pipe, the two strips entirely encircling the pipe. Then each segment between slots was heated and bent out 2″, the whole forming a funnel that just fitted inside the 20″ pipe.

At right: To support the 16″ pipe, an extra-heavy coupling was screwed onto the upper end, four ¾″ x 8″ x 6″ steel lugs having first been welded to it, as shown. Four slots to receive the lugs were cut in the outer casing by means of an electric torch, and in the concrete base with a hammer and chisel.

Dumping snow into river. Bridge in background beyond the falls.

Glens Falls City Stree[ad] S[appl]

By EDWARD J. ANDERSON
Superintendent of Public Works

LAST winter when Arthur North, world traveler, lectured here he remarked that never in 68 winters had he seen the streets of a municipality as free from ice and snow (in spite of recent storms) as in Glens Falls, New York. Naturally the Department of Public Works was gratified to receive this commendation because we have had difficult problems to overcome. In the past four years, however, thanks to more equipment and the increased use of straight salt treatment, we have made discernable improvement.

Glens Falls, the "Queen City," has a population of 18,836, but this figure does not measure its importance. U. S. No. 9, the direct, well-traveled highway between New York City and Montreal, passes through the heart of the city at Glen Street. At all times of the year it is used by many motor trucks; as many as 1,000 vehicles have been clocked in an hour's time. Four interurban bus lines carrying a constantly increasing proportion of the traffic move over the city's pavements. As the south-eastern gateway to the Adirondack region, Glens Falls is the nucleus for the trade of vast outlying areas. Even with the present restricted travel, cars from all parts of Warren, Washington, and Saratoga counties may be found every day at the business section parking meters.

During the winter of 1942-43, when the snowfall measured 80 inches, 70 miles of city streets were kept readily accessible and the pavement on the main avenues and throughout the business section were kept bare at all times. This was done by a force of forty men working with fifteen pieces of equipment, at a total cost of $16,000, which includes the actual removal, with the aid of one snow loader, of the entire fall from curb to curb in the entire business section.

In accomplishing this, we applied 200 tons of Grade CC rock salt on 10 miles of the principal streets. The first year only 22 tons of rock salt were used, but we found it so effective that each year we have employed greater quantities with proportionately favorable results. Applying straight rock salt saves manpower, manhours and equipment.

At our altitude of 948 feet, temperatures descend as low as 25 degrees below zero. Severe storms make it necessary to work thirty hours or more at a stretch and if ice were permitted to form, traveling would be seriously hampered. To some extent weather forecasts are helpful, but there are local conditions of wind and sleet that influence decisions. The best guide is "on-the-spot" familiarity with the regional behavior of the weather, gleaned from personal experience and the hourly temperature records which we have carefully charted each winter in the past.

Map of Glens Falls. Heavy lines enclose the bridge and the steep grade leading from it. The main thoroughfares radiate from the upper end of this rectangle.

Procedure Followed

Briefly, these are the steps taken to control ice and remove snow. At the beginning of a storm, when the snow has built up to a depth of one to two inches, trucks distribute the straight rock salt through a mechanical spreader at the rate of ¾ lb. per sq. yd. The anti-freeze action of rock salt brine thus employed early in the course of a storm keeps the snow soft and mealy and melts the bond between the first fall of snow and the street surface.

Before two inches of snow have fallen, eight plows leave the maintenance yards. Glen, Ridge, Broad, South, Bay and Warren streets, which are the principal thoroughfares radiating fan-wise from the city center, are salted for the entire length, and also all city bus routes, following routes carefully plotted in advance. The plows work all intersections, then other avenues and residential streets are cleared, priority being given those with greatest volume of traffic or local condition of terrain which mark them as potential hazards. Particular attention is given early in the course of the storm to the streets serving schools, churches, fire stations and funeral homes. From the

...ade Safe in Winter by Straight ...pplication

With an 80-inch snowfall, 70 miles of streets were kept readily accessible with 40 men and 15 pieces of equipment, at a cost of $16,000. Details of the procedure are described.

beginning, bus stops are kept clear to permit safe and rapid taking on and discharging of passengers.

There are five wards in the city. A truck carrying a maximum load of 7 tons of rock salt is assigned to each, and Burch spreaders attached to the trucks distribute the salt uniformly down the center of the streets. The rock salt crystals quickly embed themselves in the snow, and as they dissolve, the resulting brine works through to the pavement, undercutting the snow and ice directly beneath the salted areas. Some of it also drains to the sides of the road and undercuts snow piled up at the curb. Regardless of how much snow falls after this, there will be no treacherous ice formation to fight when the plows make a second trip around; in fact, unless the storm is heavy, a second plowing is not necessary. By putting down salt early, we are in a position to get safe, bare pavements with a minimum use of equipment. The trucks spreading the salt move at a speed of about 15 miles an hour, and therefore can cover their assigned areas rapidly enough to prevent heavy falls from getting a head start.

Because of the plan of the city, with main arteries radiating like spokes from the central business section hub, there are broad intersections and three considerable plaza areas, which are thoroughly salted, so that our Huber power grader can keep this expanse of pavement, as well as the arterial streets, bare at all times. The snow is windrowed from both the center and gutters of the streets in the business area and our Nelson snow loader is kept busy transferring the accumulation into waiting trucks. Within a short time after the heaviest storm of last winter, during which 25 tons of rock salt were distributed throughout the city, this area was bare. In addition to removing all snow from the down-town area, the loader is also used to make room for safe parking near public buildings and churches.

Eliminating slippery streets, facilitating the parking of cars, and providing a bare pavement so that through trucking is not delayed are, we consider, worthwhile contributions toward a safer municipality.

Bridge and Hill Carefully Guarded

The greatest quantities of rock salt are used at the southern approach to the city, where U. S. No. 9 crosses the Hudson river over a bridge 0.2 of a mile long and up an 8% grade for another 0.2 of a mile. Because this is a potential danger zone, a watchman makes an hourly round-the-clock inspection of the hill and bridge from the time the first storm may be expected in the latter part of November until Spring. As often as is necessary, straight salt is applied liberally, a pound to the square yard, to prevent the formation of ice. Within a half hour, salt has melted the snow and it drains down the slope, leaving bare pavement that dries in a short time. It is particularly important to protect this bridge and grade because, even when the business area streets are bare and the weather clear, mist from the falls just below the bridge can quickly form a very thin coating of glare ice on the bridge. Truckmen know that throughout the winter this stretch is guarded, and they will not experience the hazard of a slippery bridge and a steep icy grade.

The pavements on 10.30 miles of the city streets are cement, 1.05 miles are sheet asphalt type, 29.28 miles oil aggregate, 15.68 bituminous macadam, and 15 miles are soil roads. Salt removes snow equally well on all types of surface. No troublesome pavement conditions have been experienced where heavy applications were made.

Applications of straight salt to sidewalks keep the broad business-section walks safe for pedestrians. The salt is spread by shovels from a slowly moving truck.

Residents are encouraged to keep their own walks safe and the city supplies sand, or salt and sand mixture as preferred, free of charge to all who apply.

Prior to the time when we were fully equipped to handle the worst storm, we found that stubborn ice formations as thick as six inches could be melted off almost miraculously with one or two treatments of salt spread by hand. This saved laborious scarifying or chopping and made it possible to maintain bare pavement. The time and equipment saved permitted more

The snow loader at work.

extensive clearing operations with the available equipment.

Salt Replacing Abrasives

Each year more straight salt and less abrasives have been used. During the past winter less than 20 yards of sand was spread. Because salt completely dissolves, it drains off after performing its work of pitting the snow and undercutting the bond that causes a sheet of snow to adhere to the pavement; but sand and cinders require considerable sweeping following storms to render the street safe against skidding. Because so much abrasive material has to be used in repeated applications to get any anti-skid protection on ice and snow-covered pavements, catch basins and drains clog up and extra labor is required to clean them out in the Spring.

Spring Stabilization

Salt has also proved an ideal low-cost material for stabilizing several miles of soil roads within the city limits in the Spring. After shaping up the surface, two pounds of salt per square yard was distributed uniformly over the roads during May. Spring rains dissolved the salt and, after compacting the surface with a roller, the salt recrystallized as the road dried, locking in the fine particles, giving a cement-like top which resists abrasion, prevents ravelling and thus effectively keeps down the dust even during prolonged spells of dry weather.

Editor's note. The editor spent a winter in Glens Falls 55 years ago as construction engineer on the Erie Canal, and can testify that it really snows there. From November to March it snowed at least an inch almost every day—some days 12″ or more. No snow whatever was removed from the streets; any street pavement that was bare would have been impassable, for all traffic was on runners; even the wheels of the street cars (horsedrawn) were removed and replaced with runners. Sleighs and horses packed the snow into hard ice, over which the hauling was easier than on wheels. But when this 15″ to 20″ of ice (from 100″ of snow) melted in the spring and ran onto the lower sidewalks, pedestrians wore rubber boots or high galoshes and vehicles bumped from one water-filled pothole to another. The delights of sleighing are missed by this generation but the good old days had some disadvantages.

Resurfacing Asphalt With Cement Grout

Cement grout was used experimentally by the Queensland (Australia) Main Roads Commission in 1940 in treating two miles of asphalt surface 16 ft. wide which had worn to the stage where ordinarily another seal coat would be applied. Small potholes had begun to develop, cracking had appeared and the asphalt was without life.

The road was swept clean and wet and grout applied evenly by hand-brooming at the rate of 0.71 ton of cement and 1.4 cu. yd. of sand per 1,000 sq. yd. The grout was proportioned 1 cement to 2 sand, the latter grading 97.5% passing 14-mesh, 82.0% passing 25-mesh, 30.0% passing 52-mesh, and 1.0% passing 100-mesh, using 6 gal. of water per bag. The grout was spread just thick enough to fill the potholes and fine cracks and leave a thin skin over the unbroken surface. During the work the shade temperature ranged between 70° and 95° and the humidity between 25% and 100%. At one place where a heavy rain fell during the afternoon which it was thought would wash away much of the grout just applied, the surface after drying appeared better than the other sections.

Inspection two years later showed the surface to be in very fair to very good condition. In some places there was a slight gap between the edge of a mortar pat and the depression that it filled, but the mortar was loose in only a very few cases. A considerable amount of grout remained adhering to the surface between potholes. New potholes had formed, and two years after the first grouting a second was applied.

Similar treatment was given to 3 2/3 miles near Brisbane City in September 1941 and, although it carried considerable army traffic, it was in good condition in February 1943.

Experience gained on this work has shown that to get the best results the surface to receive the cement grout should be rigid and of a rough texture with a minimum of the original surface layer of bitumen remaining.

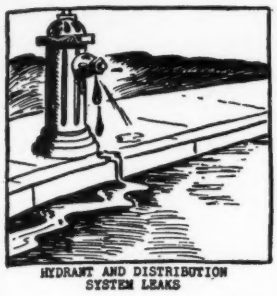
Atmospheric conditions have a considerable effect on the final result. Dull, damp weather is preferable to bright sunshine, as in this latter case satisfactory curing is very difficult owing to the dark road surface becoming very hot, which causes too rapid drying out. With such thin applications of grout, any elaborate curing arrangements give a disproportionate increase in cost.

Determination of Engineers' Fees for Sewage Plant

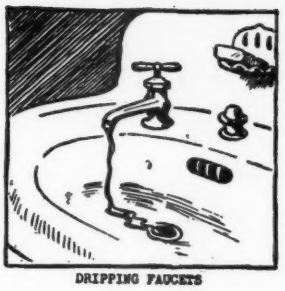
Under a contract by which a municipality agreed to pay the engineers 4 per cent of the final cost of the actual construction of a sewage disposal plant, payable 3 per cent as soon as funds were available for the construction of the project and 1 per cent in monthly installments as the work progressed, the engineers were held entitled to 4 per cent of the cost of the actual construction based upon work actually done and materials used, but not to 3 per cent on the *estimated* cost of the project, where there was no evidence of any general usage or custom which would vary the terms of the written contract. The only way the sum finally due could be absolutely determined was when the contractor finally finished the work and the job was accepted by the engineers and the city. (Cooney v. City of Belleville, 311 Ill. App. 553, 37 N. E. 2d 361.)

When Is a Public Improvement "Completed?"

A public improvement is not "complete" within the meaning of a statute that provides for the filing of a municipal claim therefor within a specific period after the completion of the improvement, so long as some essential element is lacking. A township in Pennsylvania, to take advantage of facilities afforded by a neighboring city, installed a sanitary sewer system. Before the necessary contract with the city could be executed, someone surreptitiously connected the township's sanitary system with the city's sewer system. The township filed a claim on the benefited owners, after the system eventually had been completed and made usable, and within six months after the execution of the contract and the payment to the city of the sum provided for by the contract. Such claim was required by statute to be filed within six months after "completion" of the improvement. The Pennsylvania Superior Court (Versailles Township v. Ulm, 33 A. 2d 264) held that the claim was filed in compliance with the statute, the improvement not being completed until the contract was signed and the payment made.


HYDRANT AND DISTRIBUTION SYSTEM LEAKS

INDUSTRIAL WASTE


DRIPPING FAUCETS

LEAKING PIPES

These illustrations and those below accompany the pamphlet issued by the Committee on Wartime Water Works Practice.

Use All the Water You Need, But Don't Waste Any

The Committee on Wartime Water Works Practice, in support of the nation-wide voluntary conservation program, asks waterworks men to adopt measures calculated to eliminate waste.

SECRETARY of the Interior Ickes, Defense Transportation Director Eastman, and War Production Board Chairman Nelson have asked the water supply industry to carry on a voluntary conservation program, in cooperation with the nation-wide one now under way.

> *This does not apply to YOU if:*
>
> *You have a gravity water supply with water running over the spillway at the end of a dry season.*
>
> *You do not filter, chlorinate or otherwise treat the water.*
>
> *Your sewage (which approximates in quantity the water consumption) is not treated.*
>
> *The pipes from the impounding reservoir to and including the entire distribution system are ample to supply all the fire streams needed in addition to the maximum use plus waste consumption.*
>
> *But if any item of the above does not apply to your water system, then this article DOES apply to you.*

If you do not have a gravity supply, but have to pump it, then every gallon wasted adds to the amount of fuel (coal or oil) consumed by you or the plant that provides you with power, and deducts from that available for war work.

Even if you have enough water now, if it should fall off during next year's drought a war plant, large or small, now existing or later to be established, might be deprived of needed water which is being wasted; and you can not stop waste and leaks on a day's or a week's notice.

If you use alum, chlorine, activated carbon or any other material for treating the water, the amount used (if properly used) is proportional to the amount of water that goes to the distribution system; and wasted water means wasted materials And the same applies to sewage treatment.

If any part of your piping system is of inadequate capacity during a fire, you are jeopardizing your town unless you either put in larger or additional mains, or reduce consumption. The former would require critical materials; the latter may be possible by eliminating waste.

According to the American Water Works Association's Committee on Wartime Water Works Practice, "The measures which promise to bring about the desired elimination of waste of water may be listed as follows (not necessarily in the order of their importance):

(a) *Premise inspections by the customer.*—Detection of waste in the household. Repair of leaking faucets and toilets.

(b) *Distribution system leakage studies.*—Detection and repair of leaks in the mains and service lines in the street.

(c) *Hydrant inspections by firemen and policemen.*—Control of use of hydrants against use for any purpose other than fire fighting.

(d) *Advice concerning proper lawn watering.*—Use of bulletins, etc., to show that frequent and heavy watering of lawns will not improve the lawn.

(e) *Consulting Engineering Service.*—Advice concerning better methods of operation, involving ingenuity and the experience of others.

(f) *Contact with industry, especially that engaged in war work.*—This category of customers, operating on the war-boom basis is most likely to be wasting large amounts of water or using it in such fashion as to obtain little service from it. Here re-use is often possible.

(g) *Seasonal or peak load conservation measures.* Among these are:

(1) Promotion of the most effective use of water in industry —with emphasis upon re-use of water whenever production and sanitation conditions permit.

(2) Staggering or limitation of lawn sprinkling.

(3) Reduction of air conditioning uses of water.

WRONG TYPE OF SPRINKLING-IRRIGATION

UNNECESSARY USE OF WATER

(4) Definite control of irrigation uses.
(5) Drastic reduction of sewer flushing.
(6) Reduction of street washing.
(7) Control of public or semi-public drinking fountains, swimming pools, etc.

Many of these steps require complete cooperation from other city departments and/or approval by the public service commission.

(h) *Metering.*—The metering of all consumers has been and is recognized as being one of the principal measures, if not the most important one, which is effective in the reduction of water waste. Due, however, to the shortage in scarce materials now needed for direct munitions of war and the limitations orders of the War Production Board on these materials, a normal metering program must be curtailed until such time as these scarce materials can be spared. It is taken for granted, however, that in special cases involving immediate metering of large as well as small services as a water conservation measure, the War Production Board will recognize the necessity of and grant permission for such installations.

PUBLICITY MEDIA.—The media for publicity in order of their apparent value in water conservation are:

(a) Direct to consumer material, such as cards, folders, blotters, stickers on bills and personal contact by employees.
(b) Newspaper advertising.
(c) Radio appeals.
(d) Posters in utility offices, public transportation vehicles, etc.
(e) Addresses before luncheon clubs, labor groups, women's clubs, civic clubs, etc.
(f) Contacts with municipal and state authorities to develop official support of the program—to reduce public and institutional waste of water.
(g) Contacts with school authorities to develop "Junior-citizen" interest in and support of waste control.

PROMOTION OF REGIONAL ACTIVITY.—It is contemplated that forthcoming regional conferences of water works men will set up as a part of the schedule of subjects for discussion the entire conservation program and the means to be taken to energize it in their respective areas. In other words, it is assumed that in such conferences as the Maine Utilities Association, the New England Water Works Association, the Pennsylvania Water Works Association; the Water and Sewage Works Conferences of Illinois, North Dakota, South Dakota, Missouri *and other states;* the inter-county meetings of water works men in the State of Texas; as well as in the various section meetings of the American Water Works Association, full discussions of the entire conservation program will be had and special organizations set up to stimulate local activity.

A program of this character requires for its success that whenever and wherever water works men gather in conference they consider and put into effect every possible step that can be taken to make the water consuming public conscious of its part in the water saving campaign.

REPORTS OF RESULTS ATTAINED.—The War Production Board and in particular the Office of War Utilities is in a position to outline the reporting procedure to be used by the utilities participating in the program. But, in outlining the form of reports and stipulating the frequency with which they should be filed, it is assumed that the O. W. U. will not overlook the present attitude of civilians, which is not enthusiastic when additional reports are suggested. Neither is it assumed that the Office of War Utilities will ask for reports beyond its own capacity of analysis and subsequent release.

From the viewpoint of the operating water utility it appears that there would exist a desire to record some data regarding the following results of the conservation program:

(a) Economies in fuel.
(b) Economies in chemicals for water treatment.
(c) Economies in miscellaneous materials and equipment.
(d) Economies in use of manpower.
(e) Deferred capital expenditures.
(f) Improved service to customers.
(g) Customer cooperation accorded the program.

Generally the satisfaction over having achieved the desired results can be expected to lead the utility executive to record the results.

All's Well That Ends Well

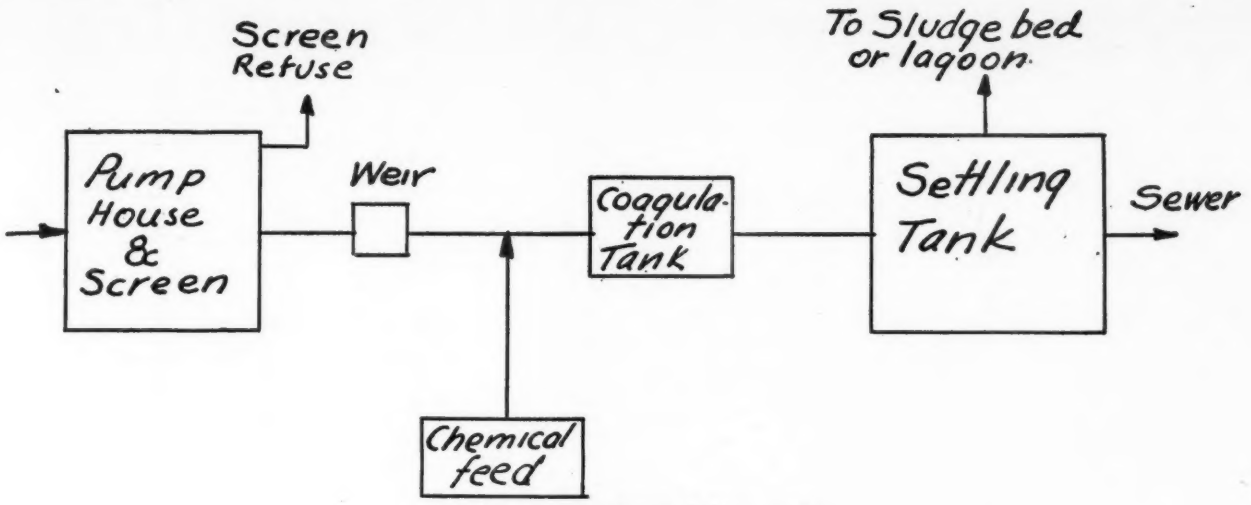
(Continued from page 19)

casing (this proved difficult and consumed a day and a half) and a ½" pipe was lowered 400 ft. into the space between the casings and thin cement grout pumped into this. After using 63 sacks of cement and stopping for a day to let it set, we measured to see to what depth the cement had risen—and found none there at all. It had presumably escaped through the perforations in the outer casing; or perhaps through the canvas packer, which might have been damaged when getting the wooden plug out.

It was then decided to fill the entire well with sand and gravel up to the 400 ft. level, this to be cleaned out after the work was finished. After about two weeks spent in trying to obtain 100 sacks more of cement, the grouting was completed in 6 or 8 days, filling the annular space for a depth of 105 ft. After allowing the cement to set for a week we cleaned out the sand and gravel, bringing with it the cement first run in which was in the condition of a sludge that never did harden. This completed the job.

After pumping half a day we had a static level of 71 ft. against 63 ft. before this work was done, and a pumping level of 165 ft. against 86 ft. before; and we got 520 gpm against 860 to 880 gpm before. (Later we lowered the pump bowls from 110 ft. in the well to 170 ft. to get the yield wanted.) We pumped to waste for 30 days, during all of which time the water gave off cement odors of varying intensity; but from that time on the water was clear and good tasting and contained 16 grains per gallon of calcium hardness. Ten or 12 test samples showed no bacteria except one 10 cc sample, and the State sanitary engineer and the county sanitarian said we could put the water into the public supply; but the city health officer, a physician, refused his consent until the well had been sterilized with HTH. After so treating the well three times, eight test samples were sent to the State Laboratory and one 10 cc tube still showed bacteria. The city health officer having no more suggestions, I used the Method No. 2 spoken of by Mr. Jensen in his article "Disinfection Methods for Deep Wells" in PUBLIC WORKS for April, 1942. After this had been completed two sets of three samples each were tested by the State Laboratory and all showed no coli organisms; but the health officer refused to accept the State tastes and insisted that tests be made by a Phoenix laboratory maintained entirely for the use of doctors. The first samples sent here were refused because no doctor had arranged for them and they were not iced. Other samples, conforming with these conditions, were reported free from harmful bacteria and with a total bacteria count of 7 per cc. As soon as this report had been received the water was placed in service. It now shows 9 grains of calcium hardness, is clear, and apparently all citizens are satisfied with the taste.

The total cost of this extra well work was about $6,000.



Flow diagram of treatment of cherry wastes.

Treatment of Cherry Waste Waters

Difficulties experienced in treating such wastes. Supplemental chemical coagulation during the canning season is found to be a help in maintaining satisfactory plant performance.

By C. H. YOUNG

District Engineer, Pennsylvania Department of Health, Meadville, Pa.

THE operation and efficiency of the municipal sewage treatment plant at North East, Pennsylvania, has been markedly affected in recent years by waste waters discharged to the sewer system from fruit canning or packing plants. The number of these plants, as well as the kinds and tonnage of fruits handled, have increased considerably during recent years. The principal fruits handled, from the tonnage standpoint, are cherries, tomatoes, and grapes, although a variety of other fruits are handled also.

The borough sewage treatment plant, excluding provisions for chemical precipitation, was designed for a population of 6,000 persons contributing 600,000 gallons of sewage a day, as contrasted with a present population of 4,000. The plant units consist of: a bar screen, an air-agitated chemical mixing chamber, two rectangular mechanically cleaned settling tanks, a dosing tank, a trickling filter with fixed nozzles, a final settling tank, sludge digestion tanks, a sludge bed, and a control house containing also equipment for summer-time chlorination. Little difficulty has been experienced in producing a satisfactory effluent from the plant except during the canning season.

Cherries are one of the principal fruits handled. Prior to the installation of waste treatment at the canning plants, composite samples collected at the sewage plant on July 19, 1939 for the 24-hour day which corresponded to approximately the peak of cherry waste waters, gave an equivalent population loading of 27,500 persons as based on the B.O.D. of the sewage flow received at the plant. Cherry wastes represent a problem that affects limited areas in the country and about which few data are available.

Red sour cherries are handled principally at North East. These are generally either brined or pitted and cold packed, but one plant cans a limited amount. Cherry brining produces practically no wastes. Cold packing and canning produce wastes, which are discharged to the sewer system. The cherries received at the plants are emptied into holding tanks containing water and ice. After the cherries have been cooled for the pitting operation, they are withdrawn through drains to an elevator and pass successively to a grader, sorting tables, spray wash, and pitters, and are finally packed, principally in cans. Most plants press the second-grade cherries for juice.

The waste waters are acid and have a high organic strength. The volume of waste waters will vary according to the different operating routines of the individual plants. Most plants press the second grade cherries for juice. The principal waste waters are: the receiving tank waters, spray rinse, cleanup water, pitter juice, and the water used to carry the pits from the pitters to the pit storage. Samples of the waste waters from the several plants have shown B.O.D.'s for a day's composite ranging from 700 to 2100 p.p.m., with total flows of 600 to 1800 gallons per ton of cherries handled. The condition of the cherries also is a factor in the strength of the waste waters.

The following table summarizes the results of analyses of samples of pitter juice, pits water, and pressed cherry juice:

Pitter Juice					
Total Solids	37,250	100,700	87,500	39,085	96,800
Vol. Solids	34,100	95,300	—	35,850	—
Oxygen Consumed	61,000	35,000	—	—	—
B.O.D.	—	38,000	55,000	44,500	49,000
Pits Water					
Total Solids	8,600	5,600	9,800	1,288	
Vol. Solids	8,050	5,300	9,200	—	
Oxygen Consumed	2,800	4,300	4,200	—	
B.O.D.	3,300	—	—	950	
Pressed Cherry Juice					
Total Solids	136,950	134,000	144,600	165,000	
Vol. Solids	132,400	132,000	139,250	158,500	
Oxygen Consumed	—	—	100,000	112,000	
B.O.D.	33,500	30,500	—	55,000	

The pitter juice and the water to carry the pits from the pitters are the most concentrated waste waters. The pitter juice contributes a substantial part of the total waste load. These wastes, if fully collected, equal, on a large volume of cherries, approximately 5 gallons per ton of cherries pitted. Four analyses for 5-day B.O.D. have been made of these wastes and these showed an average of 46,500 p.p.m. The cherry plants have been requested to collect the pitter juice either for sale or for disposal on land, as a means of reducing the strength of the waste waters discharged to the sewer system. This can effect a reduction in the strength of the total plant waste waters of about 20%. Modifying the pitting machines so as to eliminate the use of water for flushing, and mechanically carrying the pits from the machines, would reduce the strength of the plant waste waters an additional amount. The volume of water used for this purpose will vary greatly. The measured range varied from 30 to 400 gallons per ton of cherries handled.

Preliminary studies indicated that chemical coagulation would effect a substantial B.O.D. reduction and one plant is now equipped with facilities to treat cherry waste waters by chemical precipitation. The following table gives the design and operation data at this plant as based on tests made July 17, and 22, 1941:

Waste Treatment Equipment

Vibrating screen — 40-mesh.
Chemical feeders — Dry feed for lime; solution feed for copperas.
Vertical mechanical mixing chamber — 3350 gallons capacity, 55-minute detention period.
Settling basin — 7750 gallons capacity — 2-hour detention.

Analytical Data

Average of 2 days' composite samples	*5-Day B.O.D. ppm*	*Susp. Solids ppm*	*Chemicals for pH adjustment and coagulation*
Raw screened wastes...	967	605	22 gr. per gal. lime and 8 gr. per gal. ferrous sulphate.
Coagulated and settled wastes	382	74	
% Reduction, raw to effluent	60	88	

These results indicate that chemical precipitation will remove a substantial part of the pollutional strength of cherry waste waters at a not exorbitant cost for chemicals.

Where the disposal of cherry waste waters produces a stream pollution problem or prejudicially affects a municipal sewage treatment works, several methods are available, depending upon conditions, to reduce the strength or the effects of the waste waters. In some cases collection of the pitter juice and its removal for sale or satisfactory disposal, combined with fine screening of the waste waters, may be sufficient. If discharged to a municipal sewer system, liming the waste waters in addition to the above may be desirable in order to neutralize the acidity, thereby preventing souring in passage of the wastes to the treatment works. Chemical precipitation may be required in some cases, and in a few an even higher degree of treatment may be necessary. If this higher degree of treatment would be required, there is considerable advantage in discharging the chemically treated wastes to the municipal sewer system if this system includes a plant for complete treatment of adequate capacity, or if capacity can be made available through plant modifications, or through the use of supplemental chemical treatment.

Municipal sewage treatment plants called upon to handle seasonal canning plant waste waters find supplemental chemical coagulation a useful tool in helping to maintain satisfactory plant performance. Where pretreatment of canning waste waters is a requisite to their discharge to a municipal plant, there is much to be gained by the municipality employing a technically trained operator to operate the sewage plant and to assist and supervise the operation of the canning waste treatment plants.

Drainage and Embankment of Glenway Ave., Cincinnati

(Continued from page 13)

All of the work, except core drilling, was handled by city forces under the supervision of H. H. Kranz, City Engineer; Charles Brokaw, Supt., Division of Highway Maintenance; Charles Heidschuch, Assistant Supt., Division of Highway Maintenance; and Armin Aren, Sr., Structural Engineer, Division of Engineering.

The Director of Public Works is J. E. Root, and the City Manager is Col. C. O. Sherrill.

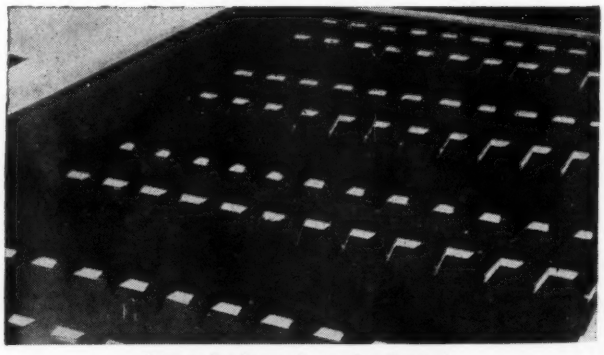
Constructing an Aerator of Non-Critical Materials

(Continued from page 15)

specifications to be acceptable, were available through a local dealer, and three of them were obtained.

In the construction of the new aerator we used white oak for posts and main beams carrying the upper screen and distribution troughs. All other framing material was cypress. All the angle bracing, at the splash boards, was made up by city employees from materials that we had on hand.

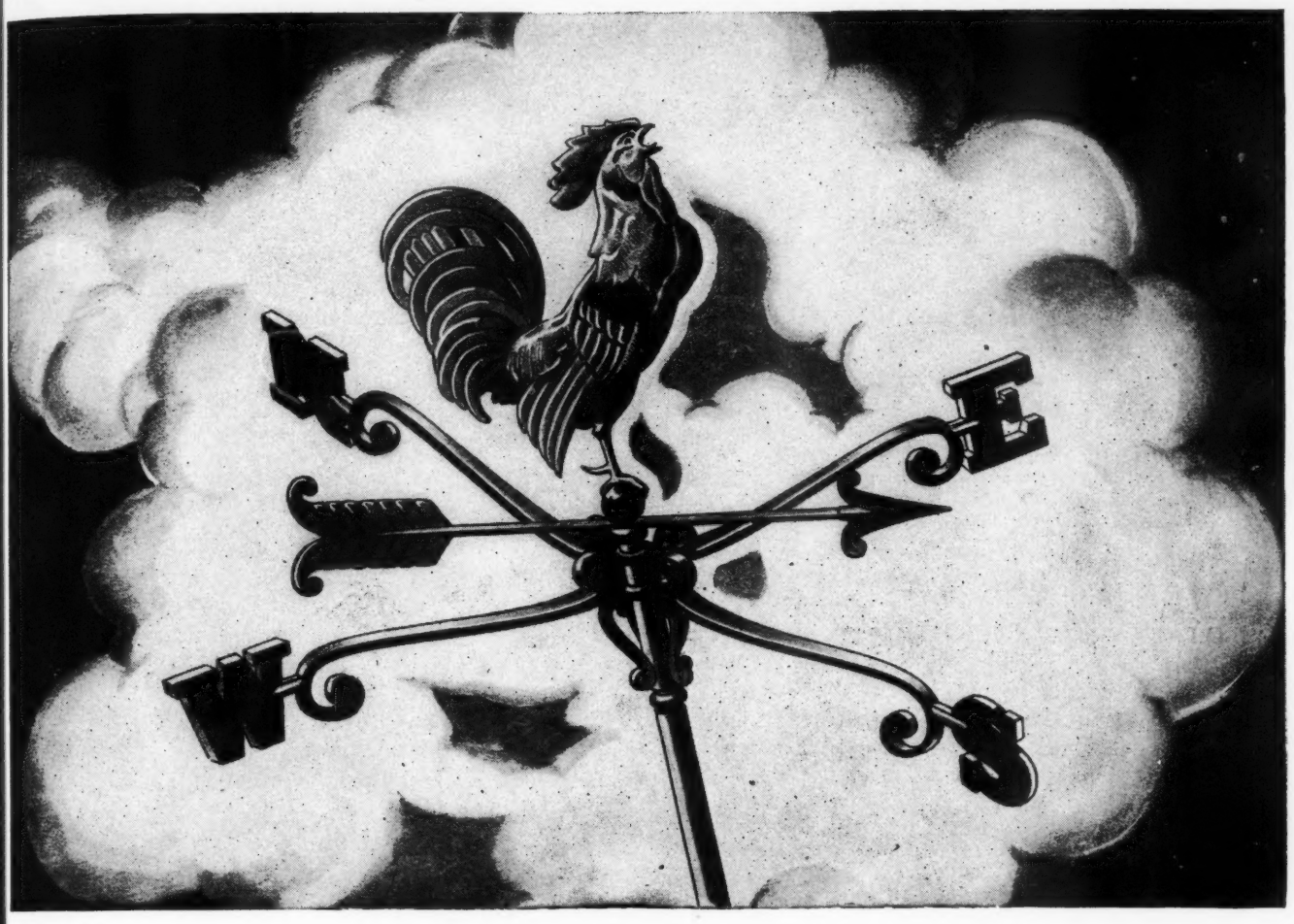
The new unit has a total screen area of 480 sq. ft. The water is distributed by gravity from a central



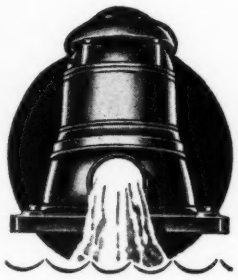
Serrated edges of wooden laterals.

chamber at the top of the structure, into twenty-two wood laterals, each lateral being a trough with serrated edges over which the water falls onto the top screen. There are three screens arranged in three levels, and the dropping of the water from each of these to the one below provides the amount of aeration required.

The painting of the structure presented a problem, because of the alternate wet and dry condition that would prevail when the unit would be in operation. After the unit was completed, it was permitted to dry thoroughly before any paint was applied. The first coat of paint was then applied by means of a spray gun and was allowed to dry for two weeks before the



WATER—FOR SOME NINETY-MILLION PEOPLE



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second coat was applied. After the second coat had been applied the unit was not put into operation for an additional two weeks.

The structure has been in operation for some time and, so far as we have been able to observe, it has been functioning in a satisfactory manner.

High Daily Rate Trickling Filter Performance

(Continued from page 14)

the plant giving the better results has an intermediate clarifier which permits recirculation. Plants employing recirculation generally gave better results. One of the filters at Owatonna is of tile and this appeared to give considerably better results than its twin containing stone.

Factors of importance influencing operation appeared to include the extent and effectiveness of the primary treatment, the biological condition of the filter (at least one unit appeared to have been injured by cheese whey), the filter loading, and the recirculation ratio. This indicates that design should not be based solely on the raw sewage loading in pounds of 5-day B.O.D. per unit of area or volume of the filter; the effect of primary treatment and of recirculation must be considered.

Two-Stage Treatment.—Excluding results from the Austin plant, in which the second unit is a standard filter, the average reduction of B.O.D. as determined by 24-hour tests for the three 2-stage plants tested (Owatonna, Lakefield and Webster City) was 90.2%. The B.O.D. of the plant effluents was rarely below 25 to 30 p.p.m.; in fact, only 3 of 16 results were under 25. Recirculation ratios varied from .05 to 0.91, averaging around 0.6. Raw sewage B.O.D. filter loadings per sq. ft. of filter surface were normally considerably under 1 pound, except at Austin, where it often exceeded 2 pounds.

The 4-hour peak-strength tests showed an effluent considerably higher in B.O.D. (the four results shown were 90, 73, 76, and 33 p.p.m. B.O.D.) and the plant efficiency in B.O.D. removal was about 87%. During these 4-hour periods, B.O.D. loadings ran from 1.19 to 1.61 pounds per sq. ft. of filter surface. Recirculation ratios were about the same as for the 24-hour period.

Suspended Solids Reduction.—Single-stage plants, during the 24-hour tests, showed total suspended solids removal of 57.5% to 91.4%, with an average around 80%. The 4-hour tests showed a higher per cent removal, but more suspended solids in the clarifier effluent. For the 2-stage plants, the average suspended solids reduction as shown by the 24-hour test was 91.6%, varying from 88.6% to 94.3%. Results from the 4-hour tests showed a greater per cent of reduction and a greater suspended solids content in the final effluent.

Nitrogen.—In single-stage plants, reduction in organic nitrogen varied widely—from 4% to 60%—averaging 38%. Tests at the Glenwood City plant indicated that reduction tends to vary with recirculation or the B.O.D. of the effluent. In general a slight decrease was also shown in free ammonia. Oxidation of nitrogen to nitrites and nitrates occurred at some plants but was not as marked as that usually obtained with standard filters or activated sludge plants.

For two-stage plants, organic nitrogen reduction ranged from 28% to 64%, and averaged 49%. Removal or oxidation of free ammonia was found to be more definite than with single-stage plants. Appreciable amounts of nitrites and nitrates were found in two-stage plant effluents, but not of the magnitude anticipated with other treatment processes.

In general, the high-capacity filters tested produced effluents low in nitrates.

Filter-Clarifier Reduction.—In the high-capacity filter, there is a continual sloughing of solids. As this matter is only partially oxidized, the filter may be considered as a biological flocculator whose effectiveness can be measured only by tests on the settled filter effluent. Therefore the filter and its following clarifier should be considered as a single treatment unit. Reduction in 5-day B.O.D. through first-stage filter-clarifier units, varied from 20.4% to 82.3% and averaged approximately 60%, according to 24-hour tests. With filter loadings in excess of 1.2 pounds per sq. ft. per day of 5-day B.O.D., B.O.D. reduction is practically constant at about 0.7 pounds. Test results did not show any appreciable change with increased recirculation. The 4-hour tests indicate that combined unit efficiency increases gradually with loading until a maximum of 67% removal is reached at a loading of about 0.6 pounds per sq. ft. per day. At a loading of 1.0 pound, the removal is 61% as compared with 64% for the 24-hour tests. Loadings of 2.0 pounds result in the removal of about 1.0 pound. Extreme loads for short periods can apparently be handled without serious loss of efficiency. Second-stage filters are usually lightly loaded and B.O.D. removal per unit loading is less. A normal reduction of 50% may be anticipated.

Distribution of Flow Onto Filters.—The distribution of the sewage to the filter surface was studied at several plants. All of the plants studied appear to be of the Halvorsen or Aero-filter type and remarks therefore apply to the types of distributors furnished with such plants. In most of the plants, practically the entire filter surface was utilized. The motor-driven disc type distributor used at Lake Mills gave excellent results, dosing 96% of the filter surface with distribution coefficients (on a basis assumed by the authors) of 1.34 to 1.44. The ideal distributor would have a coefficient of distribution of 1.00, but a value up to 1.65 for normal flow conditions is considered satisfactory.

Factors Affecting Treatment.—Many of the variables involved in sewage treatment do not permit definite conclusions concerning the degree and extent of their effect; the effect of some factors, however, is evident. Extreme fluctuations in strength and flow of sewage have an adverse effect. Since such wide variations in flow are often due to pumping, consideration should be given to this in designing such plants. Recirculation is advantageous in that it makes for greater uniformity of strength of sewage.

As regards pretreatment, it was noted that the two plants—River Falls and Lakefield—using fine screens instead of primary clarifiers, obtained reductions of only 7.6% and 11.0% respectively in B.O.D. by such screens. However, the filter-clarifier units compensated largely for this. Recirculation to the primary tank is considered to be of advantage only when the recirculated liquor contains sufficient suspended solids materially to increase their concentration in the primary tank. There was some evidence that the suspended solids reduction in the raw sewage is a function of the suspended solids concentration resulting from the mixture of raw sewage and recirculated liquor. Therefore, the authors recommended recirculated liquor to be drawn from the sludge hopper of the final clarifier.

(Continued on page 34)

your postwar PLANS!

"Blueprint Now" is the official slogan of the national *Committee on Water and Sewage Works Development** organized and functioning, state by state, to get postwar plans out of the "talking" stage into blueprint form—detailed plans and specifications—so that construction can start at the drop of a hat, when armistice comes.

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* *To communicate with the* Committee on Water and Sewage Works Development *address Suite 2110, 500 Fifth Ave., New York 18, N. Y.*

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Moisture Requirements For Soil-Cement Construction

By MILES D. CATTON
Portland Cement Association

The optimum moisture content required by soil-cement mixtures at time of field compaction is determined by conducting moisture-density tests on the mixture according to ASTM Designation: D558-40T. On field work, every advantage is taken of research and field data on tolerances that may be permitted without seriously reducing the quality of the finished work.

Research on permissible moisture content variation from optimum has been under way since 1938 in the soil-cement laboratory of the Portland Cement Association. The early exploratory work brought out clearly the facts that a certain moisture content was needed to properly hydrate the cement and that the soil held some moisture in such form that it was not free to be used by the cement in hydration. However, the most important point shown by the early research is the following conclusion taken from the report on this work:

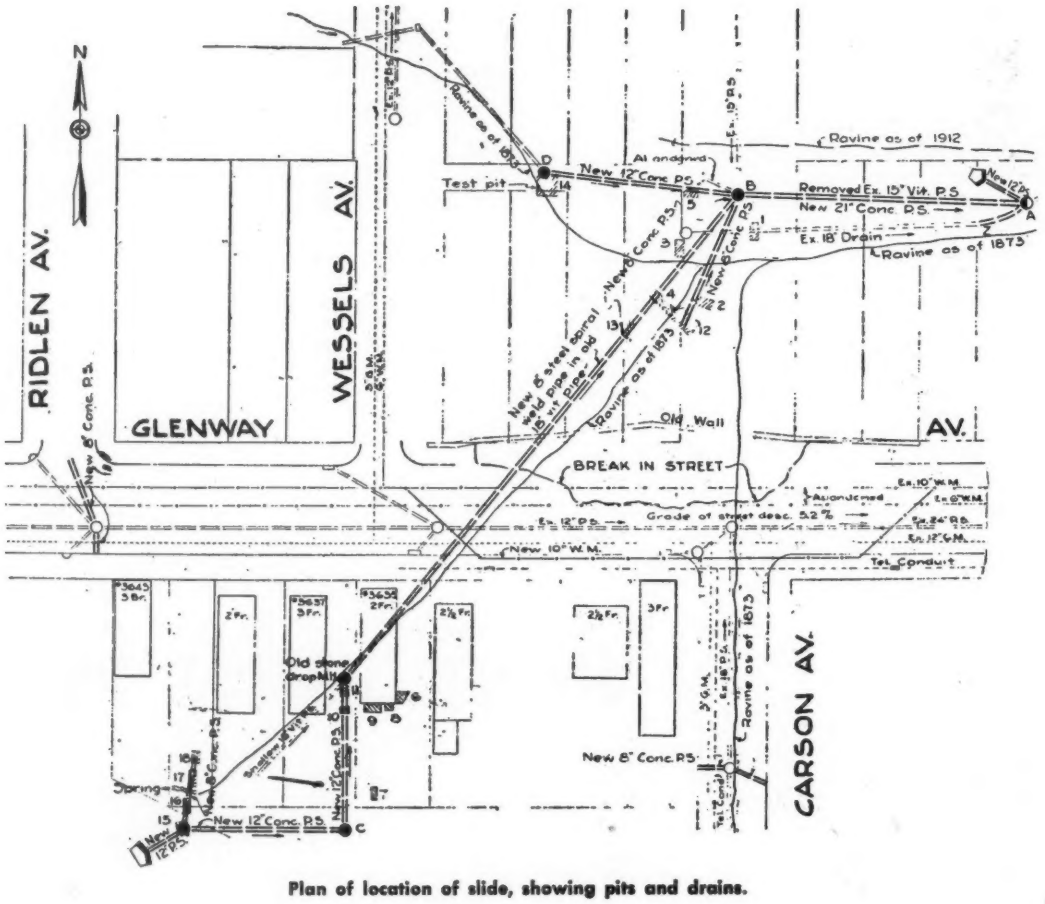
"The optimum moisture content (point at which maximum density is obtained) as shown by the standard moisture-density test is reasonably in agreement with the optimum moisture contents at which maximum durability and maximum strength are obtained. For sandy soil-cement mixtures, moisture contents at the optimum (for maximum density) are ideal for best all-around durability and strength; but for silt soils and clay soils the moisture content for best all-around durability and strength is slightly wetter than the optimum quantity."

The accumulated data from these researches to date show that the sandy and gravelly soil-cement mixtures have about the same durability and strength when compacted at moisture contents either slightly above or below optimum moisture. With the finer grained soils, which hold more moisture not available for cement hydration, moisture contents below optimum produced measurably inferior results. When compacted at moisture contents above optimum, these same soils gave as good or better results than when compacted at optimum moisture content.

These important and significant results extending over six years have proved that moisture requirements for soil-cement mixtures should be determined by ASTM Designation: D558-40T. Also, it is possible to take advantage of some moisture variation from the optimum, and recommended specifications covering this point read:

"When water spreading and mixing is completed, the percentage of moisture in the mixture and in unpulverized soil lumps, on a basis of dry weight, shall not vary from the specified optimum moisture content of the soil-cement mixture by more than one-tenth (1/10) for mixtures consisting of soils of the A-1, A-2, or A-3 PRA soil groups having less than thirty (30) per cent aggregate retained on the No. 4 sieve. With soils of A-4 or higher classification and with soils containing thirty (30) per cent or more of plus No. 4 aggregate, the percentage of moisture in the soil-cement mixture and in unpulverized soil lumps shall not be below the specified optimum moisture nor more than one-fifth (1/5) above the specified optimum moisture. This specified optimum moisture shall be that prevailing in the moist soil-cement at the time of field compaction and shall be determined in the field by a moisture-density test. ASTM Designation: D558-40T, on representative samples of soil cement mixture obtained from the roadway toward the conclusion of moist mixing operations."

With reference to the last sentence, it should be mentioned again that the optimum moisture increases as the length of damp mixing time increases during construction. It is, therefore, of utmost importance that cognizance be taken of this change to prevent



Plan of location of slide, showing pits and drains.

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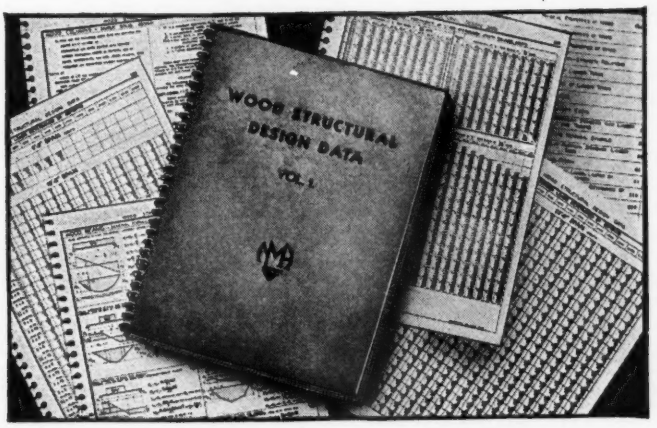
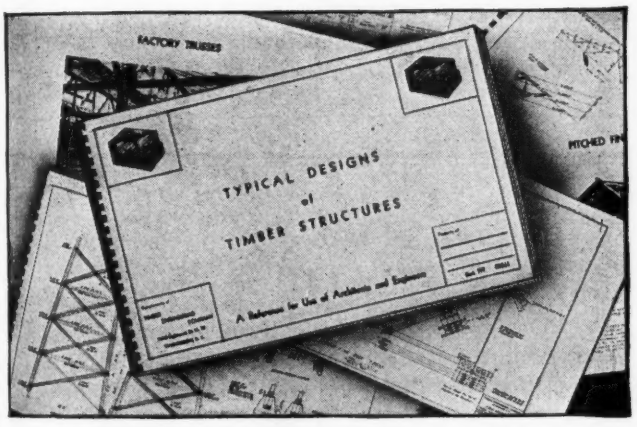
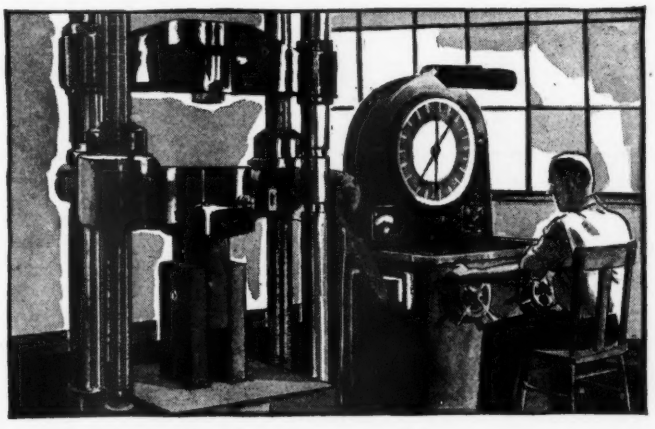
CONSULTING SERVICE. Teco maintains a staff of engineers to consult with architects and engineers on their design problems. Teco Connector distributors and fabricators in all parts of the country also render helpful services.



DESIGN DATA SERVICE. Teco has available for architects and engineers complete data on all phases of timber design, including tables and charts on timber beams, columns, floors, connector loads, bolt loads, stresses, etc.



TYPICAL DESIGN SERVICE. "Typical Designs of Timber Structures"—a 100-page book—is available to architects and engineers free upon request. Copies of several hundred other designs of typical Teco Timber Structures are also available on request.



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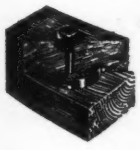

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finishing the surface on the dry side, which will likely result in an inferior surface layer of soil-cement.—From *Soil-Cement News*.

High-Rate Trickling Filter Performance

(Continued from page 28)

In general, the greater the degree of preliminary treatment, the less is the B.O.D. reduction through the filter-clarifier. This appears indicated from other general experience with this type of treatment plant.

Recirculation during night and low-flow periods appear to have little value aside from maintaining good distribution of the sewage over the filter surface. At other times, by increasing the total loading on the filter, recirculation results in increased B.O.D. removal.

No data were reported to indicate that seasonal changes in temperature had more than a minor effect on the degree of treatment obtained. For ordinary filter loadings, the use of forced ventilation appears to be of questionable value, though conservative design may dictate it when heavy or excessive B.O.D. loadings are applied. When forced air circulation is used, it should be carefully designed and controlled thermostatically. Adequate underdrains should always be provided.

The tile filter at Owatonna showed up well. However, tile does not possess advantages compensating for the high cost of such media. No conclusions could be drawn regarding the effect of the size of the stone used in the filters. The range in filter depths at the plants investigated was 6 to 8 feet. Within the limits of the tests, depths greater than 6 feet do not appear particularly advantageous.

The biological life within the filter, the character of the sewage, and the method of plant operation for perhaps a month prior to a test period, may influence results.

Sand Filters for Final Treatment.—At the Glenwood City plant, sand filters were provided following the filter-clarifier unit. Dosing rates at this plant, during two test runs, were 1.42 and 1.87 m.g.a.d.; the B.O.D. of the influent was 82 in both runs and of the effluent 32 and 25, respectively, B.O.D. tests were also run at three other plants by removing suspended solids from settled filter effluents by passage through filter paper; and the reductions in B.O.D. ranged from 30% to 63.9% and averaged 47%.

Biological Investigations.—This report also includes an account of the biological investigations made on the filter growth of two of the plants. The 20 pages devoted to this subject contain much information of interest and value.

Solves Manpower Shortage

In Corona, Calif., one man is city engineer, city purchasing agent, superintendent of streets, manager of the sewage treatment plant, superintendent of parks and coordinator of civilian defense. He has just completed a survey of several hundred vacant lots and will supervise elimination of their fire hazards. This municipal official also has a victory garden on the vacant lot adjoining his home and raises chickens and rabbits in his spare time.—*Colorado Municipalities.*

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Do you know about the new Treasury Department quotas for the current Pay-Roll Allotment Drive? *Quotas running about 50% above the former figures?* You see, these new quotas are based on the fact that the armed forces need more money than ever to win the war, while the average worker has more money than ever before to spend. Particularly so, on a *family income* basis—since in so many families several members are working, now.

Remember, the bond charts of today are the sales curves of tomorrow! Not only will these War Bonds implement our victory—they'll guard against inflation, and they'll furnish billions of dollars of purchasing power to help American business re-establish itself in the markets of peace.

So get this new family income plan working at once. Your local War Finance Committee will give you all the details of the new plan. Act today!

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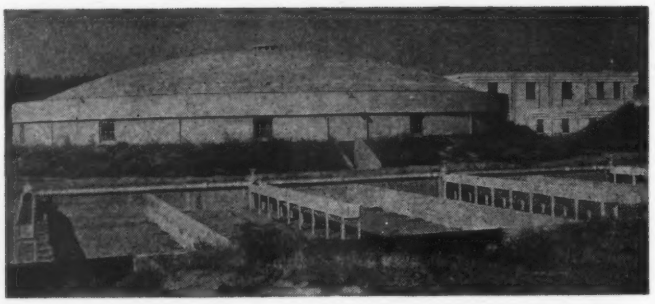


Brainerd sewage treatment plant. Concrete dome covers filter. Hitchcock & Estabrook, engineers.

The Sewerage Digest

Abstracts of the main features of all important articles dealing with sewerage and sewage treatment that appeared in the previous month's periodicals.

Treating Canning Wastes at Cokato

Cokato, Minn., has a population of 1200. During the six weeks' canning season two plants discharge more than 16,000,000 gal. of waste, largely from corn, into the sewers—several times the domestic sewage. Since 1940 this waste has been treated separately by discharging it into an embanked lagoon of 20,000,000 gal. capacity, from which it is pumped to a high-rate "Aerofilter" and flows back to the lagoon. The recirculated and partially purified waste is passed through the village sewage treatment plant, or discharged into a creek during high water. The filter is 61 ft. in diameter, with 4 ft. depth of filter medium made of tile with 1″ vertical openings (because of the acid character of the corn wastes). The distributor is the reaction type with a large number of nozzles. The two pumps have a capacity of 700 gpm each. This was operated for a year before the village plant was built, treating 16,600,000 gal. of waste having 550,000 lb. of B.O.D. It is estimated that 5,000,000 gal. evaporated, 9,200,000 gal. seeped away and 2,400,000 remained in the lagoon at the end of the canning season, Nov. 11. There was considerable odor at the filter in 1941 and it was housed and provided with forced ventilation and there was no serious odor nuisance in 1942. The plant cost $45,000. Cost of operation was ¾ to ⅞ ct. per case of No. 2 cans, including fixed charges at 7%.[G22]

Revenue Method of Financing Sewage Works

Mattoon, Ill., has for 18 months been using the sewage rate method for meeting operating expenses, retiring bonded debt and providing for depreciation. A minimum rate is charged of 48 cts. per family per month, regardless of the number of fixtures, or of whether two or more families occupy the same house. Rooms in hotels and rooming houses are billed at one fourth the family rate. Other rates are fixed for toilets in stores, offices, public buildings, service stations &c. The minimum is for 400 cu. ft. of water used per month; if more is used, the sewage rate is increased at the rate of 1/3 the water billing. The rates are charged even though a private water supply is used.[G23]

A Central America Treatment Plant

The sewage of San Miguel, El Salvador, population 17,000, is treated by sedimentation and filtering, with air drying of the sludge. Two settling tanks give 3 hr. detention for 600 gpd per capita. The filter is 59 x 69 ft., with ¾″ to 2¼″ stone 6.5 ft. deep, giving 1.4 cu. ft. per person. The sewage is measured by means of a Parshall flume. The settling tanks are V-shaped with vertical stone wall ends, the sides lined with precast concrete slabs until cement became a "critical" material; then with kiln-baked clay slabs. Sludge is discharged to an end sump through a longitudinal trough in the bottom provided with a timber cover that is made in sections. In removing sludge, these sections are raised one at a time, beginning at the upper end; the sludge meantime being removed by hydrostatic pressure through an inclined sludge pipe in the customary way, and flowing onto drying beds, where it dries in 2 or 3 days.

The tank effluent flows through a 24″ pipe to three parallel lines of 8″ pipe over the filter bed, which discharged into clay channels at right angles to them and spaced 2 ft. centres; the effluent overflowing the edges of these channels onto the filter stone in continuous sheets about a foot apart. The cost, including landscaping, was about $6,000, or 35 cts. per capita, built by native hand labor in six months.[E19]

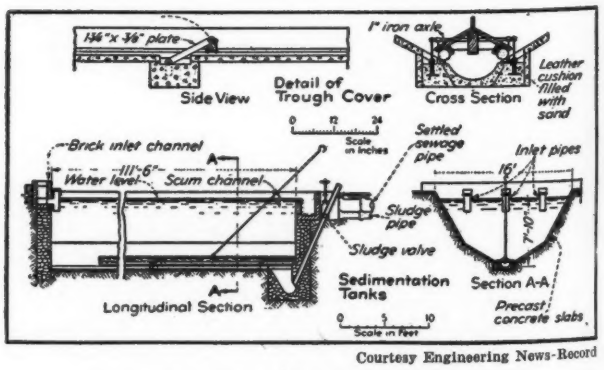
Unreinforced Sewage Tanks

The FPHA has built in Arizona several sewage tanks using unreinforced concrete, built as an arch in section and with arched end walls so that all stresses are compressive. The arches were poured continuously, avoiding construction joints. One such tank was 8 x 16 ft. at the bottom by 8 ft. deep.

One built for a housing project at Yuma was to solve a grade problem. The fall from the project's sewers to the nearest sewer main, about half a mile away, would not permit laying the connecting pipe at a self-cleansing grade; so the sewage is discharged into one of these tanks, giving a 12 hr. detention period to settle out the solids, and the clarified effluent is discharged through an outfall with a grade of only 0.1 per 100 ft. Means for flushing this with water are provided; also for pumping out the sludge.[E20]

Vacuum Filtration At Small Plants

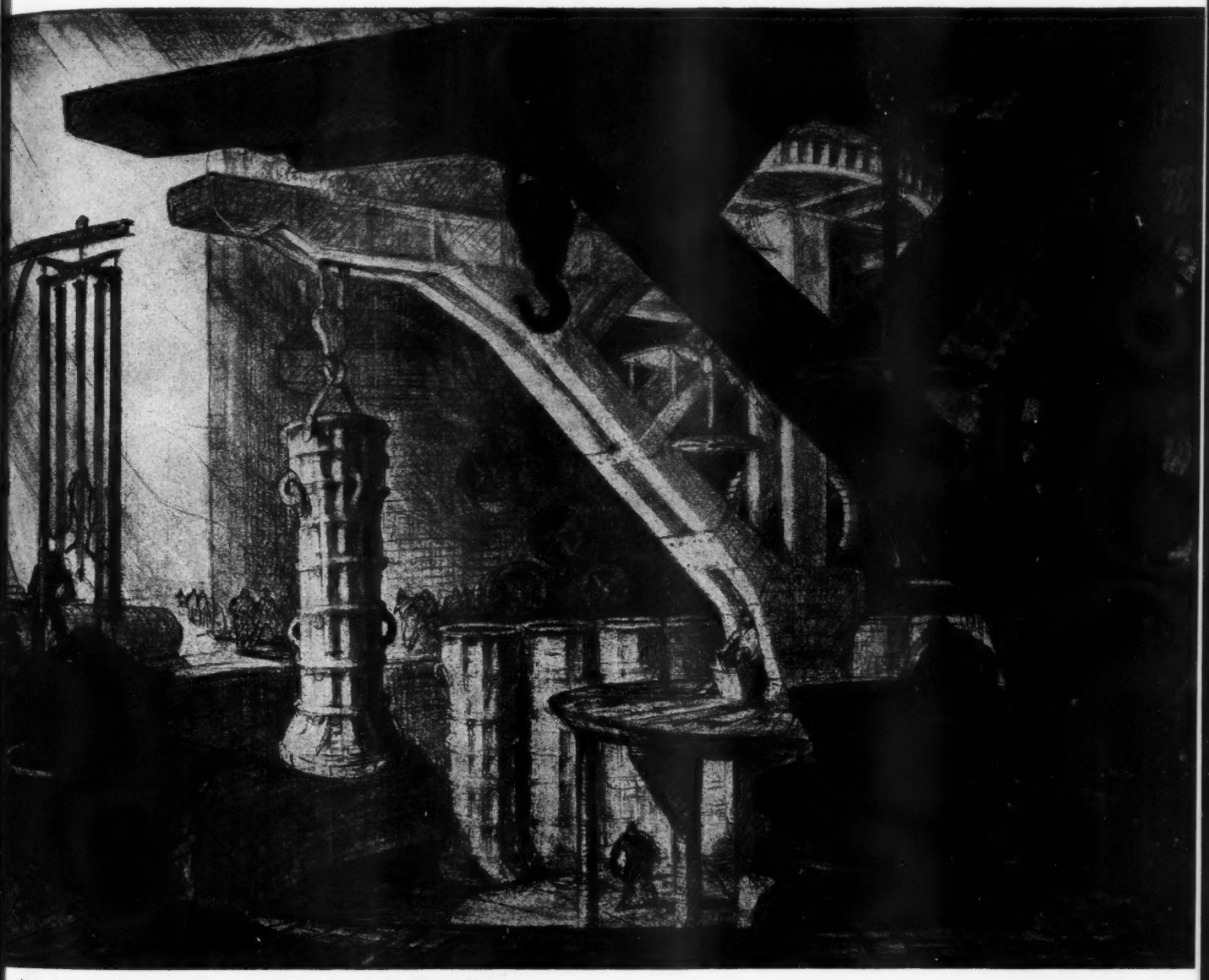
Each of two plants, one at Auburn, N. Y., population 41,315 and the other at Cortland, N. Y., population 17,000, uses 2 Conkey vacuum filters, the former 10 ft. diam. by 10 ft. length, the latter 5¼ x 8 ft. The former is operated an average of 33 hr. per week, the latter 16 hr. At Cortland, iron waste from a steel mill is beneficial; only 39% as much ferric chloride per lb. of dry solids used as at Auburn. Both find fine-ground high-calcium lime preferable to hydrated lime; but five brands of practically the same CaO content varied widely in results, the filter cake varying from 10.5 lb. of dry solids per sq. ft. of filter area per hr. to 6.4 lb. (See



Courtesy Engineering News-Record

Cross-sections of San Miguel sedimentation tanks.

Big pipe made here



A casting pit for large diameter pipe, drawn by Hugh Ferriss.

This drawing shows a pit in one of our foundries producing large diameter cast iron pipe. We can furnish pit cast pipe in diameters 2-inch to 84-inch in accordance with all standard specifications or to meet engineers' special requirements. Pipe can be made with bell-and-spigot, mechanical, flanged or flexible joints — or with plain ends. We also manufacture Super-de Lavaud centrifugally cast pipe in diameters from 3-inch to 24-inch, with bell-and-spigot or mechanical joints or plain ends, and have stocks on hand for immediate shipment. Fittings for these types of pipe can be made promptly in our special fittings foundries.

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PUBLIC WORKS for November 1942). Change from anhydrous to liquid ferric chloride shows a 12½% saving in cost, with much better results. If the ferric chloride is added before the lime, the cake is sticky and binds the filter cloths. Best results are obtained with the shortest possible mixing time. Filtering improves with increase of pH up to 10.0 but not above this. War-time cotton filter cloth gives only 50% to 60% as many hours' service as pre-war cloth.

Keeping of complete operating records is very important. Both these plants keep the following records: 1. Cu. ft. of sludge filtered each run. 2. Percent solids in unconditioned sludge. 3. Percent volatile solids in unconditioned sludge. 4. Pounds CaO per 100 lb. of dry solids. 5. Pounds of ferric chloride (dry) per 100 lb. of dry solids. 6. Specific gravity of unconditioned sludge. 7. pH of sludge before and after conditioning. 8. Duration of each run. 9. No. of hr. service for each accessory unit. 10. Percent solids in filter cake. 11. Percent volatile solids in filter cake. 12. Pounds of filter cake and of dry solids. 13. Yield in lb. per sq. ft. of filter surface per hr.

Operator's advantages of vacuum filtration; Quick disposal of sludge. Space requirements reduced. Effect of weather on sludge drying eliminated. Digestion space reduced. Eliminates cleaning of drying beds. Plants are more flexible, especially with digestion. Successful dewatering of all types of sludge.

Among their conclusions are: The most important step is conditioning of sludge; continuous-flow conditioning is faster, requires less attention and is usually more economical than batch mix. Efficiency can be improved by applying laboratory results. Filters require close supervision and considerable care. Local conditions affect amount of chemicals used, method of mixing, depth of sludge in trough and drum speed.[C57]

Freeport, L. I., has improved results by using a coarser filter cloth. Also finds that, when a cloth seems about ready for replacement, brushing it with a wire brush made the cloth work as well as new and did not seem to damage it.[C59]

Break-Point Chlorination

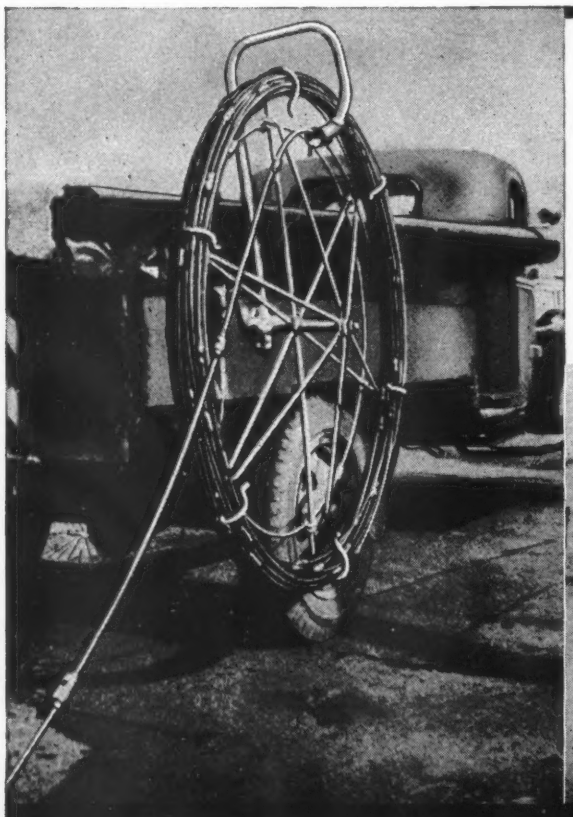
Experiments with institutional sewage, that taken from the effluent end of an Imhoff tank and trickling filter effluent, showed that a definite chlorine break-point exists on either unoxidized or oxidized sewage, but the amount of chlorine required to produce the break is much higher than dosages commonly used in sewage treatment—106 and 157 ppm for two samples of settled sewage and 27 and 58 ppm for oxidized sewage. The amount required was dependent upon the total second-stage B.O.D. of the sewage. Chlorination to the break-point did not result in an increased 5-day B.O.D. reduction over that obtained by the low dosages of chlorine commonly used, but the reduction was permanent. The B.O.D. of a chlorinated sewage varied directly with the residual chlorine beyond the first few ppm of chlorine added. The B.O.D. reduction obtained with low dosages of chlorine in amounts sufficient to give a slight residual was not permanent but lasted only shortly after the beginning of the second stage of deoxygenation.[C61]

Some Standard-Rate Filter Experiences

In operating two 4-arm rotary distributors at Westfield, N. Y., it was found that the speed, normally about 1 r. p. m., varied greatly with changing wind conditions.

The distributors slowed down and after a few months finally stopped and it was found that the arms were 9" out of level in 110 ft. diameter and the balls in the pedestal bearings were worn out of shape and some broken. The distributors were reset and no more trouble experienced.[C58]

One filter was filled with stone from an old contact bed, washed and screened; the other with new limestone



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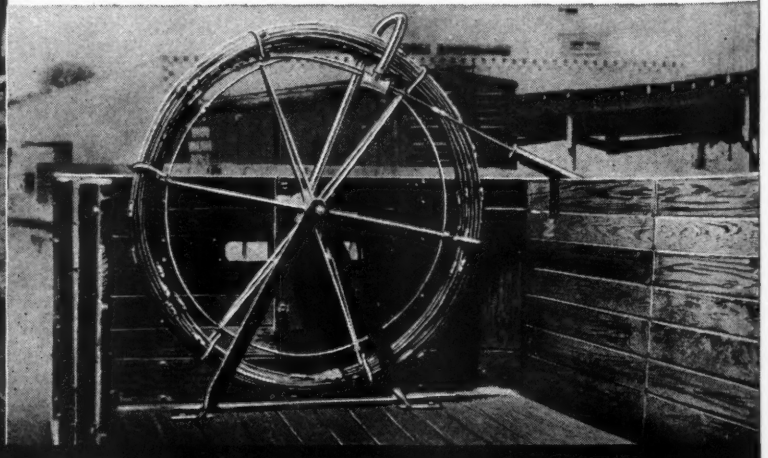

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dumped into the bed from trucks. Trouble with ponding in the latter bed became serious, but there was no ponding in the bed using old stone; it was found that there was a layer of ⅛ to ¼ inch stone 6″ to 8″ below the surface in the new stone, which should have been (but was not) screened and washed before placing. Flooding the bed with water having 10 ppm residual chlorine eliminated the ponding for two weeks but stopped biological activity for three weeks; but by flooding monthly, adding chlorine to the top 3 or 4 feet of water only, ponding was kept more or less under control with no apparent harm to filter activity. Incidentally, this cleaned out the dosing tank pipes; but each application cost $7 to $20.

The distributor nozzles were continually being clogged by leaves in the fall—partly overcome by placing a ¼ in. mesh screen over the settling tank effluent.

Digesting Paper Pulp

Waste from pulp and paper mills has seriously polluted streams into which it was discharged. Studies on the practicability of disposing of it by digestion were carried on at Cornell University for six months. Sulfite-prepared paper pulp mixed with fresh raw sludge was treated in some tanks and pulp alone added to well-seeded sludge in other heated digestion tanks. Both digested satisfactorily but it was necessary to add lime to maintain satisfactory pH, which decreased in proportion to the amount of pulp added. The amount of gas produced per pound of volatile solids consumed decreased as the carbon-to-nitrogen ratio increased, indicating that for maximum gas production a ratio corresponding to or less than that of sewage sludge should be used. The amount of gas produced per pound of pulp consumed was less than half of that produced in consuming 1 pound of sewage sludge, indicating that the sludge alone furnished a more varied or more balanced diet conducive to greater bacterial activity.[C62]

Temperature and Sludge Concentration

The effects of initial concentration, time of compacting and temperature during concentration vary for different types of sludges and can be controlled artificially more or less. Fresh solids have a jelly-like structure which is destroyed to a great extent by digestion. Sludge concentration (settling, layering, compacting or dewatering) is primarily affected by the character of the sludge, its initial concentration, time and temperature. The rate of compacting increases with increasing temperature. The rates for fresh solids and ripe sludge differ. Gas formation during storage of fresh solids is a factor. Within the limits of temperature tried (10° to 55° C) the optimum temperature for fresh solids concentration appears to be in the neighborhood of 37° C (99° F), and for ripe sludge 55° C (131° F). The temperature effect is more uniform for ripe sludge than for fresh solids. Fresh solids float but continue to compact. Ripe sludge sinks.[C64]

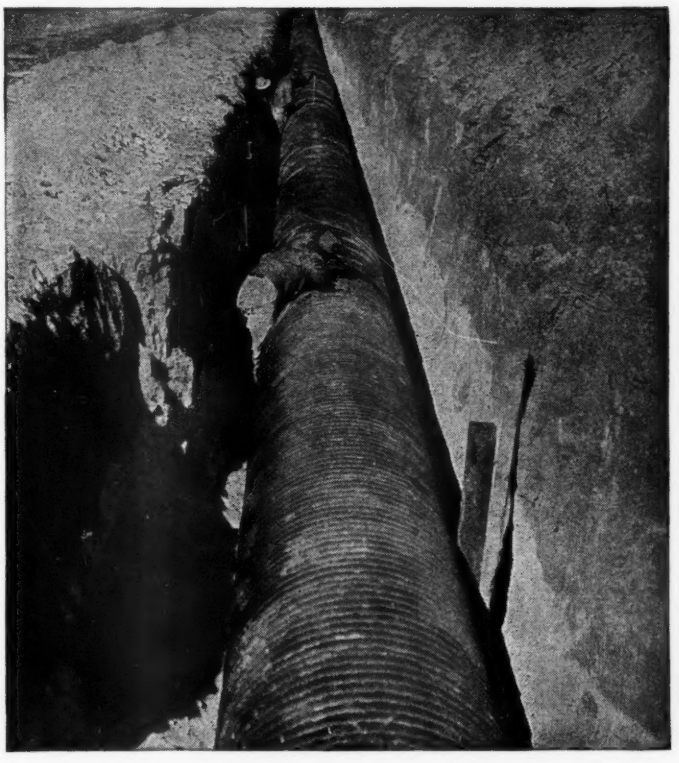
Operating Diffused-Air Activated Sludge Plants

This is a summary of experiences reported by 21 plants varying in size from Wards Island, New York, 184 mgd, to 0.7 mgd at Tenafly, N. J. Only a hint of the material contained in the 37 pages of this summary can be given here.

Insofar as the operator is concerned, there are five primary variables over which control can be exercised: 1—Concentration of mixed liquor solids. 2—Rate of sludge return. 3—Rate of air application. 4—Aeration period. 5—Condition of the sludge. These variables must be correlated into balance under the local conditions of load imposed upon each individual plant, and varied to meet seasonal and other fluctuations in load. Any adjustment made in one of the variables may require manipulation of one or more of the others.

The aeration periods at the 21 plants vary from 4.0 hr. at Chicago Calumet to 13.7 at Lancaster, Pa.; the raw

For Sewer Engineers WHO ARE LOOKING AHEAD



Future-thinking engineers will be interested in this airport drainage story: Engineering integrity demanded a pipe with safe strength to handle heavy loads. Since the port was to continue in use after the war, economy dictated that the system be as durable as possible. Designers solved the problem with Asbestos-Bonded Paved Pipe.

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It will pay you well to keep Asbestos-Bonded ARMCO Sewer Pipe in mind for post-war projects even though you may not be able to get it for immediate construction. After the war it again will be available to help solve your toughest sewer problems. Armco Drainage Products Assn., 585 Curtis St., Middletown, O.

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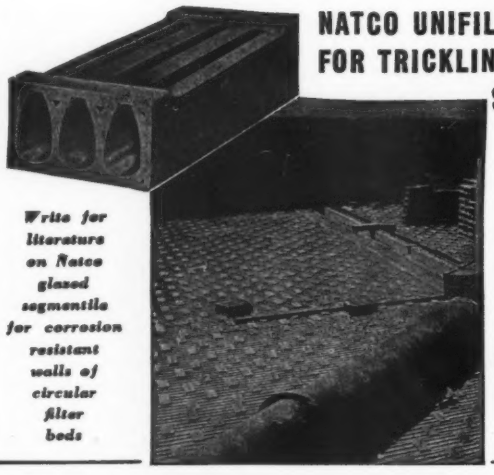
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sewage in the former case having a B.O.D. of 93 ppm, in the latter 209 ppm. However, Findlay, O., with a B.O.D. of 405, has an aeration period of only 5.5 hr. Of the 21, 14 have aeration periods between 5.0 and 8.7 hr.

Mixed liquor solids concentrations used vary from 3100 ppm to 570, but 13 range between 1500 and 2500. In general, the higher averages accompany the lower sludge indices, which vary from 40 to 346. There is an increasing trend toward recognition of the volatile matter rather than total suspended solids as a control factor.

Return rates of 20% to 30% are employed by 8 of the plants, 30% to 45% by 10 plants, and under 20% by 3 plants.

Rates of air application are expressed in cubic feet per gallon of sewage treated or preferably, per pound of 5-day B.O.D. removed. On the latter basis the rates vary from 345 cu. ft. to 2180, being between 345 and 850 at nine plants, between 950 and 1470 at eight.

The conditions of the activated sludge generally observed are 1—Appearance and odor. 2—Settling characteristics and density. 3—"Activity". 4—Types and prevalence of biological life as learned by microscopical examination.

Other questions discussed in the summary are maintenance of air diffusers and disposal of waste activated sludge.[C65]

Toronto Contracts For Sewage Treatment Plant

On Sept. 14th the City Council of Toronto, Canada, awarded a contract for the first unit of a treatment plant designed in 1933 (with some later revisions), on the demand of the Ontario Minister of Health. The entire design was divided into three sections: (1) a sea wall, sedimentation tanks, digestion tanks, control building, drop shaft and part of the outfall conduit. (2) Chlorine room, grit-removal building and tanks, mechanical dewatering plant, incinerators, repair shop and administration building, part of outfall conduit, elutriation tanks, gas holder, and oil storage. (3) Blower house, aeration tanks, final tanks, four digestion tanks, and another control building.

The bid for the first section was a ceiling price of $1,791,697; the contract is a cost-plus one, but if the cost exceeds the ceiling the contractor pays the excess. This construction will be inoperative until section 2 has been constructed. The whole project was estimated before the war to cost $9,500,000. It was designed for a population of 870,000, with provision to handle 210 mgd, which is 2½ times the dry-weather flow.[M7]

Odor Control at Minneapolis-St. Paul Plant

This plant treats 130 mgd (design capacity 134 mgd) by screens and grit removal and 2-hr. sedimentation; augmented when needed by effluent filtration, flocculation and chemical treatment. Sludge is treated by concentration, vacuum filtration and incineration. The plant includes 65 pumps and 350 motors. The flow time of sewage in the plant is about 10 hr. Some of it travels 18 miles in reaching the plant.

About a mile from the plant is an inverted siphon 600 ft. long, and a 36" horizontal pipe connects the tops of the ends of this siphon to permit continuous ventilation of the sewer past the siphon and reduce the possibility of concrete disintegration by collection of gases in the sewer. Where the sewer enters the plant there is a hinged baffle, the bottom of which rides on the surface of the sewage, which prevents gases from the sewer entering the plant. The ventilating exhaust fan is connected to the sewer at this point, removing the gases from the sewer for a considerable distance from the plant.

The screen and grit chambers are completely covered with a concrete slab and the space under it is connected to the ventilation duct; and materials are removed from them by conveyor belts running in a depressed trough which is completely covered with steel floor plates. The chambers are covered by a superstructure which is ventilated. This ventilation is effected by a 20,000 cfm fan and a main duct 48" x 36" with connections to the sewer,

to each of the four screen chambers and each of the eight grit chambers, and with openings at intervals for exhausting air from the superstructure; all controlled by dampers so that the entire fan capacity can be exerted at any one or more points. The air of the entire building can be completely changed five times an hour. The fan discharges 60 ft. above the ground.

Odors in the filter and incineration building originally were objectionable, especially from the air-agitated conditioning tanks, but this condition has been greatly improved by installing ventilating fans, and the use of unpreheated air by the incinerator.

Provision was made in the plans for prechlorination, but this has not been necessary.[G21]

Bibliography of Sewerage Literature

The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.

c. Indicates construction article; *n,* note or short article; *p,* paper before a society (complete or abstract); *t,* technical article.

C — *Sewage Works Journal*
September

57. Rotary Vacuum Filtration of Sludge and the Effect of War on Operation. By James T. Lynch and Uhl T. Mann. Pp. 807-816.
58. Standard Rate Filter Operation Experiences at Westfield, N. Y. By Joseph T. Howson. Pp. 817-827.
59. Operation of Freeport, Long Island, Sewage Treatment Plant Before and After Improvements. By E. C. McKeeman. Pp. 828-838.
60. Sewage Treatment at Military Installations. By B. F. Hatch. Pp. 839-846.
61. Effect of Break-Point Chlorination on the B.O.D. of Sewage. By Gilbert Groff and G. M. Ridenour. Pp. 847-856.
62. Digestion Studies on Paper Pulp. By Conrad P. Straub. Pp. 857-879.
63. *t.* Oxidation-Reduction Potentials Developed in Sewage and Sewage-Activated Sludge Mixtures. By W. Allan Moore and C. C. Ruchhoft. Pp. 880-893.
64. Effect of Temperature on Sludge Concentration. By Willem Rudolfs and R. P. Logan. Pp. 894-907.
65. Summary of Experiences in Diffused Air Activated Sludge Plant Operation. Data from 25 Plant Superintendents. Pp. 909-936.
66. Observations of a Consulting Engineer on Plant Operation. By Frank C. Tolles. Pp. 940-943.
67. The Joint Meeting, N. J., Sewage Treatment Works. By Ed. P. Decker. Pp. 945-949.
68. Aurora, Ill., Sanitary Dist. Plant Report. By Walter A. Sperry. Pp. 949-953.

E — *Engineering News-Record*
October 7

19. Treatment Plant Built of Local Materials. By A. N. Carter. Pp. 88-90.
20. Plain Concrete Septic Tanks for Small Housing Projects. By John Girand. Pp. 98-99.
21. Sewage Disposal Postwar Prospects. Pp. 104-105.
22. Sewer Charts Based on Scobey's Formula. By Paul E. Whittington. Pp. 108-110.
23. Sewage Disposal in South America. By Edward J. Cleary. Pp. 111-112.

G — *Water Works and Sewerage*
October

21. Ventilation Features of the Minneapolis-St. Paul Sewage Treatment Plant. By George J. Schroepfer. Pp. 353-358.
22. The Cokato Sewage Disposal Plant. By W. E. King. Pp. 359-365.
23. A Revenue Plan for Sewage Works Financing. By John A. Goetz. Pp. 366-368.
24. Disposal of Sludge in Small Plants. By G. A. Parkes. Pp. 384-385.
25. An Easier Method for Determining Suspended Solids. By Alice L. Mathis. Pp. 386-387.

H — *Sewage Works Engineering*
October

41. Equipment Maintenance in Time of War. By Morris M. Cohn. Pp. 469-478.
42. Gas Engine Operation at Aurora, Ill. By Walter A. Sperry. Pp. 479-481.

J — *American City*
October

13. What Elutriation of Sewage Sludge Can Do. By C. G. Weber. Pp. 91, 93.

L — *Civil Engineering*
October

6. Discharge of Pipes Flowing Partly Full. By Carl Rohwer. Pp. 488-490.

M — *Water and Sewage*
September

7. Toronto Sewage Treatment Plant. Pp. 20-22, 46.
8. *p.* Effect of Activated Sludge Process on Poliomyelitis Virus. By H. J. Carlson, G. M. Ridenour and C. F. McKhann. Pp. 23-24, 39.

P — *Public Works*
October

40. *n.* Priorities as Applied to Sewage Works Construction, Maintenance and Operation. P. 7.
41. *c.* Trenching and Laying Sewer and Water Pipe. Pp. 11, 24-48.
42. Landscaping Sewage Treatment Plants and Sewers. By I. Russell Riker. Pp. 17-18, 50.
43. Walnut Bottom Run Improvement at Beaver Falls, Pa. By D. F. Harvey. P. 23.

LAKESIDE

New Centrifugal Nozzle for Aero-Filters

Lakeside's new centrifugal nozzle consists of two pieces, body and cover. These are designed so that all threads for attaching cover to body are eliminated. It is only necessary to set the cover on the body outlet and give it a slight turn to the left to lock it in place.

The cover is also designed to prevent plugging of the orifice by matches and other accumulated material.

Let us cooperate with you in the design of your sewage plant for post-war construction. Aero-filter plants have lowest initial and operating cost.

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LAKESIDE ENGINEERING CORPORATION
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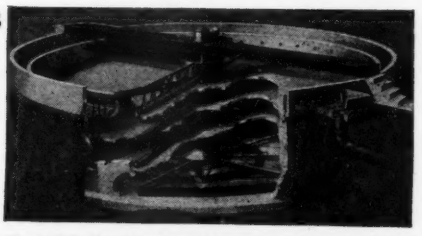
P.F.T. Clarifiers for Rapid Precipitation of Sewage Solids



The P.F.T. Tray Clarifier embodies a design which effects the continuous rapid separation of the solids and liquid in sewage; and the immediate removal of the clarified effluent. A series of shallow settling areas over which the sewage is spread assures speedy precipitation. Its high rate of flow provides maximum capacity in minimum space; reducing the construction and operating costs of clarification equipment.

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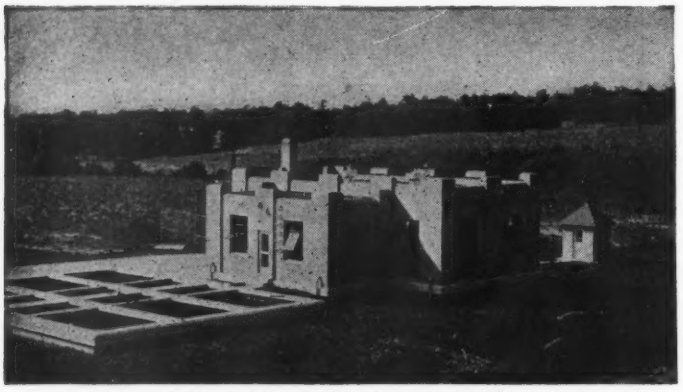


General view of filter and pumping plant, Oldham County, Kentucky.

The Waterworks Digest

Abstracts of the main features of all important articles dealing with waterworks and water purification that appeared in the previous month's periodicals.

Booster Station Built in Record Time

Construction of this station, in Detroit, was described briefly in PUBLIC WORKS for September, page 40. Further facts given by this article are as follows: Plans were made early in May; application to FWA for permit was made May 15 and finally approved May 21; contracts signed May 28; ground broken June 1; foundation for first pumping unit poured June 11; first pump unit erected June 20; two units and a chlorinator ready to operate July 12, and all four units by July 28. Connections to the distribution system were completed by the middle of August. Lack of common labor and race riots on June 21 delayed the work until July 7, by which time the force had been increased gradually to 144 day shift, but it proved impossible to increase the night shift above 47.[E17]

Hydrant Maintenance In Little Rock, Ark.

With normal maintenance work curtailed by war restrictions, Little Rock has employed its personnel in putting its fire hydrants in first class condition. In the past one man had been on continuous hydrant inspection duty, covering all hydrants four or five times a year. In recent work a 3-man crew checks the field location of each hydrant with the office record; notes whether it is out of plumb, set too low or high, too close to curb, or if there are obstructions to operation; uses the water phone to detect leaks; records the static pressure and examines for and corrects leaks at nozzles, gaskets and stuffing box; records pressure with hydrant flowing; makes all minor repairs, including caulking nipples, greasing cap threads, replacing cap leathers, cutting grass around hydrant; wirebrushes and cleans for painting.

Painting is done by a man pulling a small wagon containing paints of five colors—green for caps (capacity over 1,000 gpm), orange (500 to 1,000 gpm), red (less than 500 gpm), yellow for barrels, and black, a ring of which indicates a dead-end hydrant. From 24 to 52 hydrants were painted per gallon of paint, which was applied by brush.[F64]

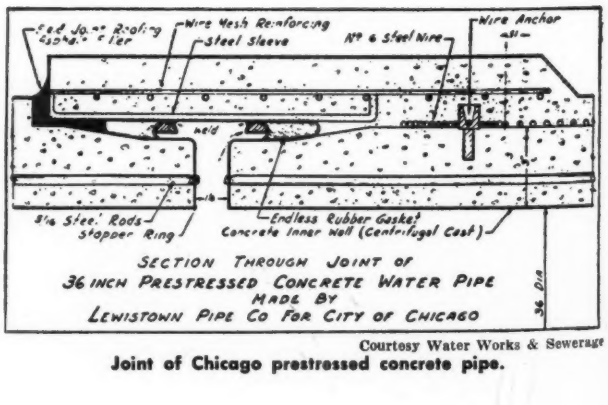
Ozonation Tests In Philadelphia, Pa.

In March 1941 Philadelphia began operating a 1 mgd pilot plant for testing ozone treatment of Schuylkill river water, chlorine treatment of which gave it a noticeable taste. The plant was installed by Ozone Processes, Inc. Two ozoning towers were installed, 17'7" and 7'7" water depth, into which water was introduced at the top, and ozone at the bottom through a grid of "aloxite" tubes. Wheel agitators were installed just above the diffusers but did not increase the ozone absorption sufficiently to pay their operating cost. There were 2 ozonators, an air dryer, 4 compressors and an after cooler. Each ozonator had a rated capacity of 10 lb. per day; contained 28 plate-type dielectric assemblies. Plate voltages were varied from 12,775 to 16,500 in six steps; 60-cycle 220-volt current was used.

The average results for a year were: Ozone dosage, 1.27 ppm; ozone residual 0.123 ppm. Threshold odor of filter effluent 49.2; the same after ozonation, 19.0. Chlorination gave a medicinal odor, ozone a flowery or balsamic odor. There were no significant bacteriological differences between the two, but ozone removed a much higher percentage of non-coliform lactose fermenting organisms. The total power required was 16.6 kwh per lb., costing 7 cts. per lb. It was found that ozone rendered manganese and iron in the water insoluble, necessitating filtration after ozone treatment of water containing manganese; this improved coagulation and suggested ozone pre-treatment. The ozone demand of the filtered water was 1.27 ppm, of the unfiltered settled water, 1.5 ppm. Construction cost of ozone treatment may prove an obstacle to its adoption.[F66]

Concrete Pressure Pipe in Chicago, Ill.

Chicago has recently laid 11,244 ft. of 36" feeder main, using Lewistown prestressed concrete pipe with Class B cast iron special fittings, as cast iron pipe was prohibited by WPB. The pipe was made in 12 ft. lengths as follows: A steel form with a 3" inside flange at each end is used. Eighteen 5/16" longitudinal steel rods pass through the form and its end flanges 1" from the inside face of the form, and nuts on the threaded ends of the rods are screwed up to stress each rod 30,000 lb. per sq. in. Enough concrete is placed in the form to make a shell 1½" thick and the form is revolved at 250 rpm for 10 min. Then more concrete is placed and spun for 12 min. to increase the thickness to 3", the surface being trued with a bar. Then during 5 min. further spinning a thin coat of mortar is troweled into the surface. The pipe is then steam cured for 24 hr., the forms removed, and it is steam cured for at least 2 days. Then it is spirally wound with No. 6 spring steel, oil-tempered wire with ultimate tensile strength of 210,000 to 225,000 lb. per sq. in., spaced on 0.51" centers, with a constant pull on the wire of 2600 lb., giving a compression stress of 1500 lb. per sq. in. in the inner wall. The pipe is then tested under 200 lb. pressure, a steel sleeve pulled on one end



Courtesy Water Works & Sewerage

Joint of Chicago prestressed concrete pipe.

to make the joint, and set inside a vertical form and an outside wall 1″ thick (to protect the wire) poured and vibrated. It is then steam cured for two days. A laboratory test indicated that the compressive stress in the concrete would be reduced to zero at 230 lb. internal pressure, that cracks might form at 275 lb. but would close again when the pressure fell. When the pipe had been laid it was tested under 105 lb. pressure without leaking at either pipe or joint. (The city pressure is 37 lb.).[G39]

Fluorides and Dental Caries

For several years past attention has been directed to the quantitative relationship between the fluoride content of domestic waters and the amount and severity of endemic dental fluorosis (mottled enamel). H. T. Dean, a U. S. P. H. S. dental surgeon, suggests dividing waters into: 1—Those carrying naturally the optimal concentration of fluoride, i. e. about 1.0 ppm; 2—Those carrying an excessive concentration of fluoride; and 3—Those deficient in fluoride. It is possible that it may be desirable to treat public water supplies to remove the excess F from No. 2 and add to that in No. 3. Others called attention to the fact that milk and other food contains fluoride, and that the *total* amount ingested should be the criterion, not that in water alone. Abel Wolman, considering among other ideas and experiences, those of the introduction of iodine into Rochester's water supply a few years ago, endorsed Dr. Dean's statement relative to the addition of fluorides to waters: "Much investigative work is necessary before serious thought can be given to a recommendation for its general application."[A111, 112, 113, 114]

Standards for Chlorine Residual Determination

The authors, chemists of Wallace & Tiernan Co., state that there is obvious need for a practical set of permanent standards to be used with the ortho-tolidine test, and that: Any standard of the set should be usable at all cell depths; the stock solution should represent 10 ppm chlorine and the standards representing all other residuals should be obtainable by proportional dilution of the 10 ppm standard; the standards should be composed of readily available materials; their preparation should not require special technique; they should remain stable for approximately six months. They describe standards which are a modification of Scott's chromate-dichromate standards and which, they say, meet these requirements except that the standards for residuals above 1.5 ppm at cell depths less than 240 mm are not prepared by proportional dilution. All standards are 0.1 *M* with respect to phosphate buffer. The buffering effect of the chromate-dichromate is balanced against that of the phosphate so as to maintain the proper color of each standard.[A116]

Ozone Treatment Of Swimming Pool

A swimming pool at Peasholm, England, is filled with 420,000 gal. of sea water, which is taken first to a 20,000 gal. settling tank, then dosed with filter alum and pumped to rapid pressure filters, then heated to 5° or 6° above air temperature, and sterilized with ozonised air. This air is introduced into a pipe carrying the water just before it enters the bottom of a contact tower 16 ft. high and 9 ft. square, the air being drawn in at the throat of a venturi tube where there is a vacuum of 10.7 in. of water. From the contact tower the water overflows to the pool. The ozone apparatus operates at up to 4250 volts, using 50-cycle A.C. The water is circulated at 73,000 gph, giving a turn-over period of 6 hr. The installation maintains the water in a satisfactory and attractive condition. It is sterile as it leaves the contact tower and the B. Coli counts in the pool are low and frequently nil. A dose of 150 grams of ozone per hour, produced at 3700 volts, is found sufficient for normal times with several hundred

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A BATH!

Placid jungle streams can be deadly carriers of water borne germs. Over here, sparkling brooks may be a haven for the wastes and impurities of industrial plants.

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Shown above is a 30-inch manually operated M & H Gate Valve, ball-bearing and rising floor stem, for the new Water Filtration Plant at Mobile, Alabama. We furnished hydraulically operated Valves and manually operated Valves for this Filtration Plant, just completed with a capacity of 20,000,000 mgd. Expert workmanship and highest quality materials make M & H products dependable.

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SQUARE BOTTOM GATE VALVES
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FLARED FITTINGS
B & S FITTINGS
FLANGED FITTINGS
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Write for Catalog 34!

M & H furnishes both regular type A.W.W.A. fire hydrants and special Traffic Model—all compression type, dry top and revolving head. Special Traffic Model (shown at left) is growing rapidly in popularity because it is designed to yield at the ground line under impact, due to its breakable bolts and breakable coupling on stem. Repair then is easy without shutting off pressure. Simply install new bolts and coupling.

M&H VALVE
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bathers, but with heavy bathing loads is run at 270 grams per hour at 4250 volts.[D17]

Bibliography of Waterworks Literature

The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.

c. Indicates construction article; *n*, note or short article; *p*, paper before a society (complete or abstract); *t*, technical article.

A *Journal, American Water Works Ass'n*
September

109. Civilian Defense and Public Water Supply. By U. S. Grant 3rd. Pp. 1139-1145.
110. The War's Effect on English Local Government. By Arthur Collins. Pp. 1146-1155.
111. Domestic Water and Dental Caries. By H. Trendley Dean. Pp. 1161-1186.
112. The Public Health Significance of Dental Deficiencies. By Harold J. Knapp. Pp. 1187-1190.
113. A Program of Treatment of Public Water Supply to Correct Fluoride Deficiency. By David B. Ast. Pp. 1191-1197.
114. What Are the Responsibilities of Public Water Supply Officials in the Correction of Dental Deficiencies? By Abel Wolman. Pp. 1198-1200.
115. Rapid Tests of Water Quality. By T. W. Gilcreas. Pp. 1201-1204.
116. Colorimetric Determination of Chlorine Residuals Up to 10 ppm With Ortho-tolidine. By N. S. Chamberlin and J. R. Glass. Pp. 1205-1221.

D *The Surveyor*
September 10

17. *p.* Ozone Water Treatment at a Scarborough Swimming Pool. By H. V. Overfield. Pp. 377-379.
September 17
18. *p.* 2,000,000 Gallon Reinforced Concrete Reservoir and Water Tower. Pp. 387-388.
19. *p.* Ozone Treatment of Swimming Pool Water. Pp. 389-390.
September 24
20. *p.* Laying a 36-Inch Water Main Through a Large City. Pp. 397-398.

E *Engineering News-Record*
September 23

17. Booster Station Built in Record Time. By Louis E. Ayres. Pp. 96-99.
18. New Method Used to Make Prestressed Concrete Pipe. Pp. 100-102.
19. Reservoir Roof of Unreinforced Arches. Pp. 103-105.

F *Water Works Engineering*
October 6

64. A Worthwhile Wartime Maintenance Project. By L. A. Jackson. Pp. 1126-1128.
64. Well-Paid Employes Make for Better Water Departments. By W. P. Hughes. Pp. 1129-1130.
66. Ozonation Tests on Philadelphia Water Supply By Martin J. McLaughlin. Pp. 1131-1134, 1157.
October 20
67 Operation of the Wanaque, N. J., Supply System. By Charles H. Capen. Pp. 1184-1185, 1202.
68. Improvements to River Intake at Omaha, Neb. By J. C. Detwiler and K. H. Larkin. Pp. 1186-1190.

G *Water Works and Sewerage*
October

39. *p.* Experiences With Wire-Wound Prestressed Concrete Pressure Pipe. By W. W. De Berard and W. B. Weldon. Pp. 378-383.

J *American City*
October

20. 142 Years of Water Distribution. By M. J. McLaughlin. Pp. 150-152.

L *Civil Engineering*
October

7. Removal of Air From Pipe Lines by Flowing Water. By A. A. Kalinske and Percy H. Bliss. Pp. 480-482.

M *Water and Sewage*
September

19. *p.* Pumping Station Construction at Western Air Fields. By A. J. Taunton. Pp. 15-19.
20. *p.* Construction of Wells for Public Water Supplies. By Herbert Grove. Pp. 25-26, 45.

P *Public Works*
October

46. *c.* Installing a Turbine Pump at Roxboro, N. C. By C. M. Abbitt. Pp. 15-16, 56.
47. Background of Philadelphia's Water Waste Control Program. By Martin J. McLaughlin. Pp. 20-22.
48. Solder for Lead and Copper Pipes. P. 22.
49. Preventing Freezing of Elevated Steel Tanks. By Walter H. Metcalf. P. 52.

X *Journal, Pennsylvania Water Works Operators Ass'n*
Year of 1943

11. What Victory Alum Is. By L. L. Hedgepeth. Pp. 52-54.
12. Victory Alum: A Symposium of Opinion on Its Use in Pennsylvania Water Plants. Pp. 55-71.
13. Conservation of Materials Through Conservation of Water. By William R. Schnabel. Pp. 72-76.

Mr. Water Works Superintendent:

You are responsible to your city for the maintenance and operation of its water service. The chances are about 10 to 1 that you are not using the amount of repair material that the War Production Board authorizes you to use. How can you justify the continued undermaintenance of your city's water system?

From a notice by Secretary Harry E. Jordan in the October issue of the Journal of the American Water Works Ass'n.

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For the rapid location of metal curb boxes, street boxes, meter boxes, drip boxes, manhole lids and sewer clean-outs. When the loop aerial passes over the covered box, the earphone gives off a signal that sounds like the whistle of a Bob White, hence the name. The loop aerial does not have to be over the center of the lost box to give the signal, if one edge of the loop is over one edge of the box the signal starts.

The manufacturers say that the Electronic Box Locator covers an area of 114 square inches, is easily operated, requires no special skill, will not pick up bottle caps, nails or any metal objects, and is not affected by snow or ice.

A New Self-Priming Pump

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Milwaukee, Wis.

An improved automatically controlled valve is a distinctive feature of the new Type AO self-priming pump. The design and operation of its valve arrangement is an important factor in the quick and effective self-priming action of this pump.

Priming of the Type AO pump is accomplished as the motion of the water throughout the pump runner and the volute passage carries behind it a slug of air, drawing air in the suction passage through the impeller and out through the priming chamber. This hydraulic action lifts the column of water in the suction line and achieves the same results as would a separate vacuum pump. The priming valve closes slowly during this process, acting against a spring tension which governs the rate of priming and the static height of the priming suction lift. The automatic closing of the valve after complete priming prevents water from bypassing back to the suction chamber, with resultant power loss.

The pump impeller has an unusually thick vane with rounded inlet edges, permitting the pump to pass stringy materials and fairly large solids.

Allis-Chalmers plans a complete line of the self-priming Type AO pump, from 1 to 6 inch size, although only 2 inch and 3 inch sizes are ready for immediate sale. The entire line of pumps will range from a very small capacity to 1400 gpm and up to heads of 100 feet or over. The

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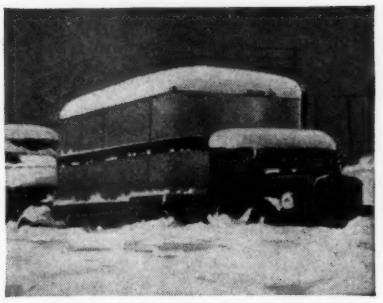
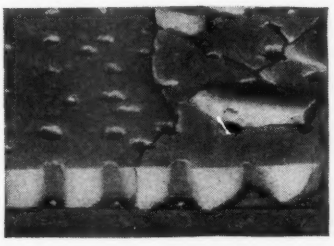


Vital war supplies must not be destroyed —or even delayed en route — by accidents due to treacherous ice-ridden streets and highways! So as soon as a storm breaks... get your men and equipment out spreading Sterling "Auger-Action" Rock Salt. Applied early enough in the storm, it keeps snow from packing and bonding to pavements—makes complete removal easy. Bare pavements are safest. Remember... it takes 2½ to 7 times as long to stop a car on ice as on bare pavements!



Even when snow packs down hard... Sterling Rock Salt does a most efficient job. The biting crystals bore through, as shown by the model here, melting the snow and ice...forming a brine which loosens the bond between pavement and ice. Thus loosened and honeycombed, the snow and ice can easily be removed by scraper and plow! Rock Salt treatments are economical, too. Not only is the initial cost low but when straight Rock Salt is used, it eliminates the cost of cleaning streets, and catch basins which ordinarily become clogged with sand and cinders!

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Fischer & Porter Co.
County Line Road
Hatboro, Pa.

This is a new improved Rotameter (Series 700) for all types of flow rate measurement. Its clean, efficient attractive design which emphasizes its many new features will appeal to the modern instrument engineer.

Rotameters consist essentially of a tapered pyrex glass metering tube with the wide end at the top with the fluid flowing upward through the tube. A metering float moves freely up and down the tube, accurately assuming a position in the tube in proportion to the flow rate. Uniformly spaced scale increments give easily visible readings to the operator. Rotameters handle flows from 5 cc's to hundreds of gallons per minute at pressures up to 10,000 p. s. i. and temperatures up to 750 degrees. Accuracies of 99.5% are maintained throughout the long scale length, at ranges up to 20 to 1 and more. Corrosive and dangerous fluids are handled with ease.

The Master Enclosed Rotameter is easily installed with inlet and outlet connections that can be swiveled in any horizontal direction throughout a complete 360 degree turn as well as the vertical. An ingenious arrangement permits stuffing box adjustments directly from the outside without danger of hitting the metering tube with a wrench. The removal of a few screws permits the Master Enclosed to practically fall apart, if disassembly is desired for any purpose. These are but few of the many advantages fully discussed in Bulletin 25-D, which will be sent without obligation at your request.

Water Conservation

American Water Works Association
500 Fifth Ave., New York 18, N. Y.

This is a voluntary and selective program to aid water utilities in the cooperative "Stop Water Waste" campaign. The officers of the association have gone to great lengths in compiling and making available for water works officials, practical suggestions and plans for reducing water waste. It was perhaps inspired by the fact that it is difficult to increase water supplies during the war, but conservation of water is an exceedingly important consideration during normal times because it means reducing cost.

The secretary of the association states that the volume has been mailed to the executives of water works in cities of 10,000 and over and in a letter to them it was stated, "we are not sending you a bill. It is priced at $2.00. If you can send the AWWA a check for $2.00, do so. If you cannot, and want to keep the book and use it, tell us so." And added that copies are available for smaller communities which are sufficiently interested to write for them.

The smaller water works plants would benefit by this volume as much proportionately as the larger ones.

Pipe and Tube Bending Handbook

The Copper & Brass Research Association
420 Lexington Avenue, New York 17, N. Y.

A new and complete treatise showing methods and devices for bending pipes and tubes of copper and its alloys. This book has been prepared at consumers' requests for authoritative information on this subject. It contains 80 pages of text with 113 figures and illustrations including 35 full pages of unit weights of tubes of different alloys with varying diameters, wall thicknesses and shape, as well as pertinent information on the chemical and physical properties of such pipe material.

The text covers subjects such as hot and cold bending, minimum radii, temper, the use of mandrels of various

types and many other essential factors. Bending with the use of filler materials such as sand, rosin, salt and low melting temperature alloys are described and illustrated. Step by step procedures for both smooth and wrinkle bending of large diameter pipe show methods and equipment in considerable detail.

It is available to those who need information of this kind if they will write to the Association.

Free Leaflet on New Lumber Design Specifications

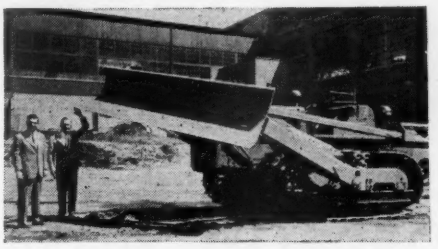
The application to engineering design of the "National Emergency Specifications for the Design, Fabrication and Erection of Stress Grade Lumber and Its Fastenings for Structures—Directive 29," made mandatory by the War Production Board on and after November 1, 1943, is simplified through use of the *Wood Structural Design Data* series of publications issued by the National Lumber Manufacturers Association, Washington 6, D. C.

The Association has prepared a leaflet, entitled, "Notice to Owners of Copies of W.S.D.D.," which tells how to use the series in conjunction with the WPB directive and specifications. The leaflet is available free upon request to the 150,000 owners of past editions of this series.

American Road Builders' Association

Official Nominations for
Officers for 1944 and Directors for Three Years

For President: C. W. Brown, Chief Engineer, Missouri State Highway Department, Jefferson City, Mo. For Vice Presidents: Paul B. Reinhold, President, Reinhold & Co., Inc., Pittsburgh, Pa.; Charles W. Smith, President, Smith Engineering & Construction Co., Pensacola, Fla.; Lion Gardiner, Vice President, Jaeger Machine Co., Columbus, Ohio; Robert A. Allen, State Highway Engineer, Carson City, Nev. For Treasurer: H. C. Whitehurst, Director of Highways, District of Columbia, Washington, D. C. For Directors, Term ending 1947: James C. Alban, President, Alban Tractor Co., Baltimore, Md.; C. H. Buckius, Chief Engineer, Pennsylvania Department of Highways, Harrisburg, Pa.; Samuel C. Hadden, Chairman, Indiana State Highway Commission, Indianapolis, Ind.; M. J. Hoffman, State Commissioner of Highways, St. Paul, Minn.; Frederick Hoitt, Secretary, New England Road Builders' Association, Boston, Mass.; E. L. Roettiger, State Highway Engineer, Madison, Wis.; Charles M. Upham, Engineer-Director, American Road Builders' Association, Washington, D. C.

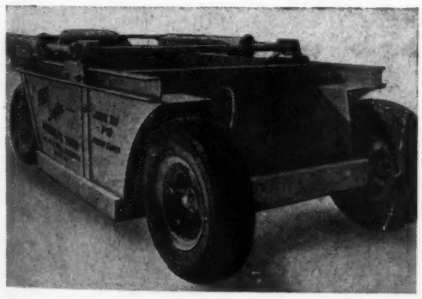


Jos. F. Heil, Exec. Vice Pres. and Howard Mann, Southwest Representative looking over the new Heil Trailbuilder.

Newly Designed Machinery on Duty from Arctic to Panama Jungle, Cutting Paths for Highways

The Heil Co.
Milwaukee, Wis.

The new units are the Heil Trailbuilder and the Heil Bottom-Dump Trailer Wagon. The wagon and its heavy



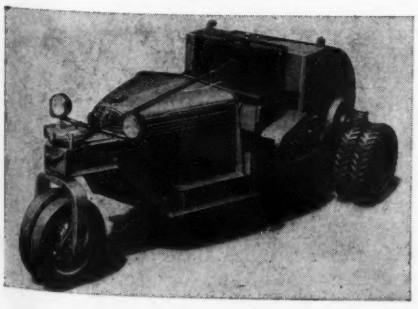
Allied Armies meet the enemy with success on all fronts, but there must be no let down. We must continue to confound the enemy with superior equipment, superior armies, superior command. We must hold the pace until it is safe to slacken it.

WARCO-DUPLEX Hydraulic Scoops—simple, sturdy, economical. Easy loading, with controlled spreading. Maneuvered with minimum effort in confined spaces. Right for any dirt moving job.

WARCO ... does its Part!

WARCO Hydraulic Control Motor Graders—an answer to the operator's desire for easy-to-operate machines. Build economically with WARCOS, the machines with staying power.

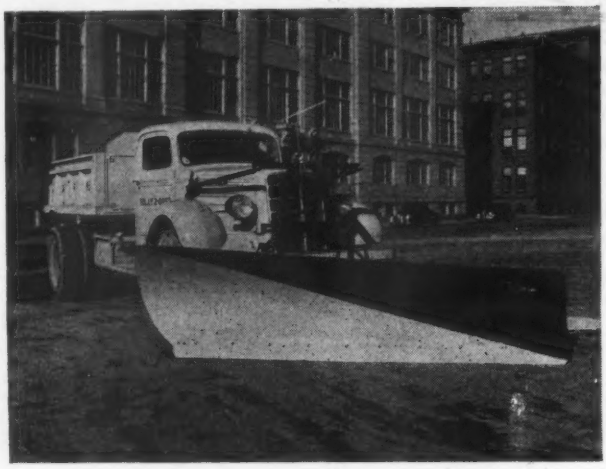
WARCO "Whizzard" Roller — a machine converted from Rolling to Transport in 4½ minutes. No loafing on the job. With the "Whizzard" every minute counts.



Until you can again order WARCO Road Machinery, consider its fine qualities of easy, fast hydromotor control, simple construction, economical operation. One day we will ship machines to you.

W. A. RIDDELL CORPORATION
BUCYRUS, OHIO

WARCO-DUPLEX Hydraulic Scoops in 2-Wheel models have same construction as 4-Wheel Scoops. Are more maneuverable for close quarter cuts and dumping over embankments.



ANDERSON PLOWS

are doing their part for war by keeping open the nation's highways, streets, airports and industrial plants.

If you need new plows, as many do under increased activity, the action of the War Production Board will be found to be fast and thorough in acting on requests for releases under order L192.

Rugged, Modern Efficient

ANDERSON plows are available for all 'round snow removal work and their rugged, modern design assures economical and efficient operation.

Prompt deliveries can be made.

ANDERSON ENGINEERING CO.

21 CHARLES ST. CAMBRIDGE, MASS.

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duty wheel tractor is 36 feet long, weighs 34,000 pounds, and is capable of hauling a load of 25 tons.

In the "bottom dump" system in the Heil wagon is a brand new idea.

The new clamshell type bottom dump doors in the Heil Trailer Wagon swing up alongside the hopper. The doors, operated by a power driven cable, flash open in two seconds and when they are open the vehicle has more clearance than before it dumped. The doors close automatically by gravity and lock when back in position.

The newly designed Heil Trailbuilder incorporates many special features which make it an outstanding contribution to the earth moving equipment field. Action of the blade is governed by a power control unit recently perfected by Heil engineers. This unit assures the operator smooth, positive action, full visibility, and minimum cable stress.

Behind the operating efficiency of the Heil Trailbuilder is strong, rugged, "built to take it" construction. The sturdy side arms hold the blade rigidly in position. The cutting edges are of specially treated alloy-steel—they are removable as well as reversible. Adjustable mushroom grading shoes are available as special equipment on either type of blade and are readily replaceable.

The ABC of Electronics at Work

Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.

The fundamental principles of the six basic ways in which electronic tubes function are explained in a new 36 page booklet.

Schematic drawings of the tube construction and diagrams showing the typical circuits for the various functions are used to explain how electronic tubes rectify, amplify, generate, control, transform light into current and current into light. Industrial and military applications for each of the six basic functions are described and illustrated. High frequency heating, dynetric balancing, resistance welding control, radio and radio-telephony, television, Precipitron, industrial and medical x-ray are a few of the electronic devices that are included.

A copy of booklet B-3260 may be secured from Department 7 N 20, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

A New Steel Flooring Catalog

Kerlow Steel Flooring Company
222 Culver Ave., Jersey City 5, N. J.

This 24-page catalog describes and illustrates open steel flooring, gratings and safety steps. It is entitled "Industry's Magic Carpet," and features large illustrations which show the proportions and construction of many different designs of open steel flooring. Installation views show the applications of open steel flooring and the use of this construction for armored flooring, bridge paving, safety steps, sidewalk gratings, etc. A standard safe load table and sketch of typical floor plan, together with complete dimensions of the various types of flooring and safety steps will assist engineers and construction men in selecting and laying out flooring for individual requirements. Copies of this informative catalog can be obtained by asking the company for Catalog MC 43.

WPB Publishes "Salvage Manual for Industry"

The new book contains 245 pages of systematically organized and classified information and data—most of it of a "how-to-do-it" nature—on industrial salvage practice in all of its ramifications. Material is presented in 26 chapters, grouped into 6 major sections. There

are 2 chapters on organizing and planning the salvage department; 3 on the administrative factors; 12 on methods of handling (finding, identifying, segregating, collecting, reclaiming, storing, selling, etc.) metal scrap; 3 on non-metallic waste; 7 case histories demonstrating exemplary practice; a 17 page compilation of practical hints for handling specific waste materials; and a 9 page index.

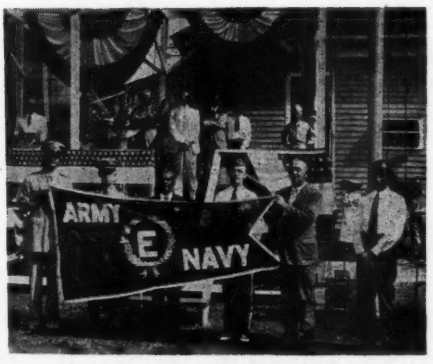
(Published by Technical Service Section, Industrial Salvage Branch, Salvage Division, WPB. Paper-bound, 6 in. x 9 in., 250 pages. Price $.50 per copy. Procurable through the Superintendent of Documents, Government Printing Office, Washington, D. C.)

A New Edition of Water Supply and Treatment

The fifth edition of this instructive volume is now made available by the National Lime Association, Washington, D. C. The author, Charles P. Hoover, has revised and brought it up-to-date.

It embraces 210 pages divided into 16 chapters—Sources of Water Supply; Methods of Water Purification; Coagulation and Sedimentation; Filters and Filtration; Disinfection or Sterilization; Tastes and Odors; Prevention of Red Water and Corrosion; Water Softening; Chemistry of Lime-Soda Ash Process of Water Softening; Softening Water for Municipalities; Removal of Iron, Manganese, Silica, Hydrogen Sulphide and Flourides; Recarbonation of Lime Softened Water; Zeolite Process of Water Softening, etc.

In addition to much new material the new edition contains modern illustrations, drawings and color plates. The publishers say the increased cost prevents unlimited distribution of free copies but on request one free copy will be sent to all individuals directly identified with the treatment or proposed treatment of Water Supplies. Additional copies may be had at 65 cents each.



Army-Navy "E" to

United States Pipe & Foundry Co.
Burlington, N. J.

The award was made July 20th to the men and women of the company's North Birmingham, Ala., Works.

In the picture from left to right in the foreground are: Lt. Col. J. E. Getzen, Birmingham Ordnance District; Lt. Com. E. S. Brown, U.S.N.R.; Robert Allen, Fred McDaniels (Representatives who received Award Emblems for employees); J. S. Bridges, Resident Manager, North Birmingham Works; H. A. Gaddis, Member of Company Color Guard.

New Pump Bulletin

Peerless Pump Company
301 West Avenue 26
Los Angeles 31, Calif.

Improved methods of pumping water from deep wells are described in a new pump bulletin. Two basic methods of raising water are illustrated—the turbine and by hypocycloidal. The difference between oil and water lubrication is also shown. Interesting cross-sectional views of deep

JAEGER "Sure Prime"
— Pumps that Exceed Their Promises

The only pumps that, for years, have been individually tested and certified for vacuum, capacity, pressure and regularly exceed their guaranteed performance — with up to 5 times faster 100% automatic priming, high capacity under adverse conditions, thousands of hours of extra service. Self-cleaning shells, replaceable liners, longest life seal, oversize shafts — for high pressures, continuous heavy service.

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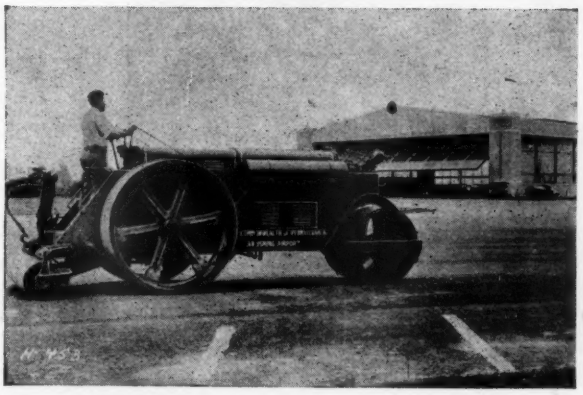
Where landing speeds often exceed 100 mph . . .



HERCULES IRONEROLLERS Smooth the Way . . .

From Portland (Oregon) to Capetown (South Africa) Hercules Ironerollers are playing an important part in construction and maintenance at airports and landing fields. The Hercules levels as it rolls, without damaging compactions; irons out wheel marks and high spots; smooths the way for high-speed take offs and landings. *For any tough, exacting, rolling job . . . roll out the Hercules!*

THE HERCULES COMPANY
MARION, OHIO

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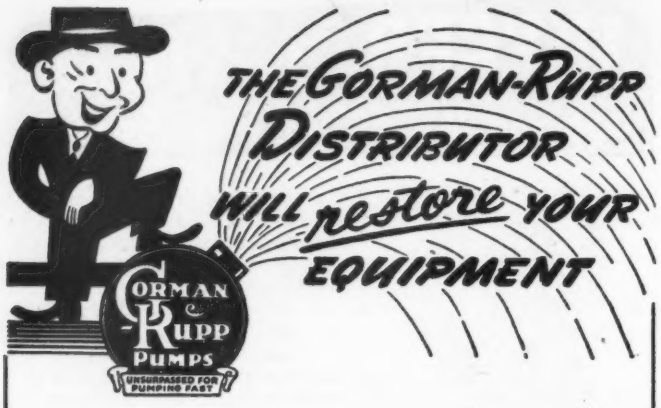

As more materials are diverted to essential war uses, new equipment becomes more difficult to get. Greater care must be given present equipment until after Victory. Let your Gorman-Rupp distributor restore your equipment to its original operating efficiency. They carry parts and repairs for all equipment they sell. Their charges will be reasonable.

Gorman-Rupp Self-Priming Centrifugal Pumps are available for immediate delivery through Gorman-Rupp Distributors.

THE GORMAN-RUPP CO. Mansfield, Ohio

THE PARK HOTEL

TODAY, more than ever before, our friends and guests are depending on regular week-ends at this famous Spa to keep themselves fit for war-time duties.

After a period of exhausting, nerve-wracking incidents in your business, you need a few days at the Park spent in rest, relaxation and Spa baths in famous Magnetic Spring Water.

Our record speaks for itself—over sixty years of enviable service with 5,000 patrons—some families coming in the third generation—Magnetic Spring Water, the only medicinal water of its kind in the world—and served to Park Hotel guests only.

THE PARK HOTEL

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Twelve miles west of Delaware, Ohio—a moderate drive from principal Ohio cities. Rates and folder sent promptly on request.

IN CLEVELAND, PHONE PROSPECT 2922

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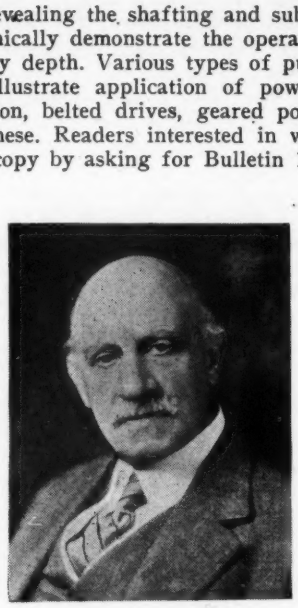
well pumps, revealing the shafting and submerged pump elements graphically demonstrate the operation of lifting water from any depth. Various types of pump heads are included, to illustrate application of power, for direct motor connection, belted drives, geared power and combinations of these. Readers interested in water pumping may obtain a copy by asking for Bulletin 141A.



Hal Williams Hardinge

Hal Hardinge, Inventor, Is Dead

Hal Williams Hardinge, inventor, consulting mining engineer and chairman of the board of the Hardinge Company, Inc., of New York and Hardinge Manufacturing Company of York, Pa., makers of machinery, died September 15th in his home at 75 Greenway South, Forest Hills, Queens, after a long illness. His age was 87.

In 1938 the American Institute of Mining and Metallurgical Engineers awarded to him the James Douglas Medal "for his inventions and apparatus for fine-grinding of ores." He had previously won the John Scott Medal of the City of Philadelphia and the Longstreet Medal of Franklin Institute.

Mr. Hardinge first developed the conical ball mill used in the grinding of ores. This lead to the development of classifiers, feeders, agitators, pumps and thickeners for use with the mill in the treatment of ores. The thickener was similar to the clarifier used in the Sewage and Water treatment field and in 1926 the Hardinge Co. entered this field with the circular clarifier and digestor followed by the rectangular clarifier.

New Personnel Appointments at Gardner-Denver Company, Quincy, Illinois

R. H. Rodolf has been made manager of the Pump and Compressor Division following the death of R. J. MacFarland. Mr. Rodolf's connection with the company dates back to 1917 when he joined the Canadian Rock Drill Company at Vancouver, B. C., a subsidiary of the Denver Rock Drill Manufacturing Company of Denver, Colo., later merged with Denver-Gardner. He was transferred to Quincy in 1939 as assistant manager of the Portable Compressor and Rock Drill Division.

C. M. George was appointed as Mr. Rodolf's assistant. He joined the Gardner-Denver organization in January, 1929. Up to his recent appointment as assistant manager of the Pump and Compressor Division, Mr. George had been connected with the General Sales Department.

Davey Appoints Eighmy Equipment Co.

Davey Compressor Company, Kent, Ohio, has appointed Eighmy Equipment Company, Rockford, Illinois, as a franchise dealer in Davey Portable and Industrial Compressors, Truck Power Take-Offs and Pneumatic Saws for Western Illinois and Wisconsin.

War and Peace

An intriguing word-and-picture story as to how "Caterpillar" products of peace became tools of war almost overnight is told in a new booklet, "War and Peace," published by Caterpillar Tractor Co., Peoria, Illinois.

Photographs and paintings are used to illustrate modern machinery at work on both peacetime and wartime operations.

The fact that the same "Caterpillar" equipment will be able to switch back to the task of rebuilding the world and aiding the progress of tomorrow when the final shots have been fired, is also stressed.

For a free copy of this 16-page booklet, request Form 7993.

Proportioneers' 10th Anniversary Banquet

%Proportioneers, Inc.% Observes Its 10th Anniversary

A banquet at the Narragansett Hotel, Providence, R. I,. celebrated the anniversary. The affair was attended by many employees and their guests and all had a pleasant evening, with group singing and dancing. Following the dinner, speeches were made by the officers of the Company, Rudy P. Lowe, President; Herbert E. Hollberg, Vice President; Henry S. Chafee, Treasurer and Earl H. Bradley, Secretary.

%Proportioneers% entered the field of Flow Responsive Chemical Feeding as a small Chicago manufacturer early in 1932, building a device called Treet-O-Unit which was, at that time, primarily used in railroad locomotive water conditioning.

Recognizing that any modern mechanical product reflects the experience, engineering ability and skill of the manufacturing organization behind it, %Proportioneers% in 1933 associated themselves with Builders Iron Foundry, Providence, R. I., whose reputation as specialists in the field of flow measurement made them a logical ally. In September of that year a corporation was formed and %Proportioneers, Inc.% moved to its present offices in Providence.

A decade of close cooperation between the two companies has resulted in the development of a series of standardized devices and methods applicable to all Automatic Treating, Feeding, Diluting, Blending, Proportioning and Sampling operations.

In the past ten years, %Proportioneers, Inc.% has supplied over 10,000 units. These include measuring and dispensing pumps with automatic control for the proportional feeding and blending of liquids, which equipment is used in industrial chemical process work and for water treatment and purification in both the industrial and sanitation fields.

Prior to Pearl Harbor, %Proportioneers, Inc.% were serving industry in such types of manufacture as the sterilizing and conditioning of water for drinking, Textiles, Rayon, Rubber, Plastics, Paints, Motor Fuels, etc.

During 1942, the company turned its entire effort to redesigning and modifying its products for specific war uses such as Army and Navy portable water purification units, units adapted for sterilizing and conditioning of water supplies to Army camps, the manufacture of Synthetic Rubber, and 100 Octane Gasoline.

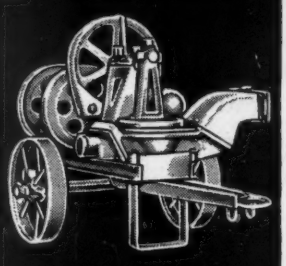
C. H.& E. CONSTRUCTION EQUIPMENT

Single and Double Diaphragm Pumps

Diaphragm pumps have a definite place in the dewatering pump field. Slow speed and low cost, for pumping sewers and footings where slow seepage and extremely dirty water is encountered. 3" and 4" single and double types. Capacities to 12,000 G. P. H.

Write for Bulletin

3841 N. PALMER STREET



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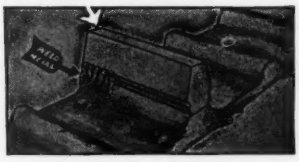

ALLIED STEEL PRODUCTS, INC.

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Wood Construction Does Rot

CUPRINOL **Stops Rot and Insect Borers**

Of course no self-respecting government would let rot go as far as that shown here—but maintenance and repairs run up budgets. Paint protects the surface, but where water gets under the paint, as around this spout, rot does dirty work. One treatment of Cuprinol as a priming coat would have impregnated the wood fibres and prevented this rot. Prevention by Cuprinol saves repairs from rot. Applied by brush, spray or dipping.

Write for information and literature

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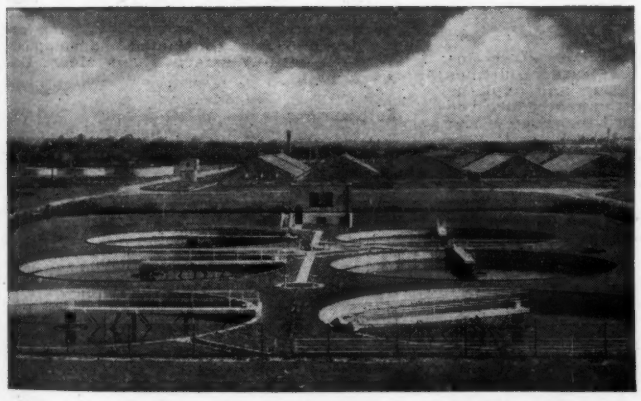
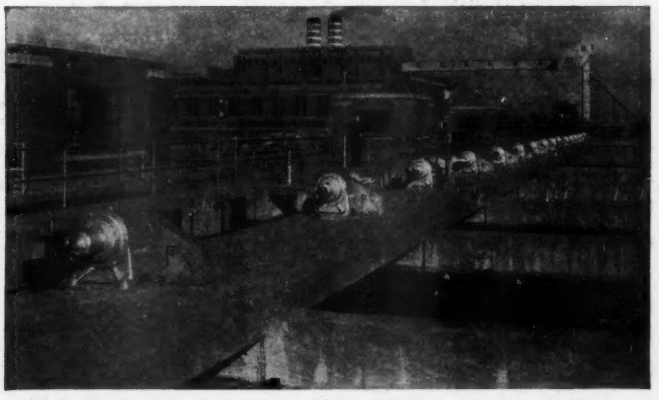
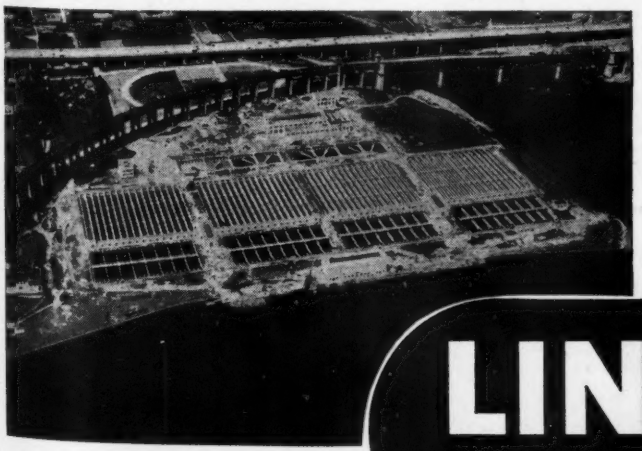


City of Dayton, Ohio sewage treatment plant. Showing six final tanks equipped with Link-Belt Circuline Sludge Collectors in this modern plant.



Southwest Sewage Treatment Works, Sanitary District of Chicago. Equipped with Link-Belt Straightline sludge collectors, bar screens, mixers, screw conveyors, belt conveyors and other equipment.



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Air Raid Shelters

3. New 8 page booklet pictures and describes a corrugated pipe shelter with gas tight end walls, emergency escape tunnel and other desirable features. Armco Drainage Products Assn., Middletown, Ohio.

Bridges

7. Teco Connectors, a new method of structural engineering, to spread the load on a timber joint more equally over the cross-section of the wood is described in new literature available from Timber Engineering Co., Dept. BS-2, 1319—18th St., N. W., Washington, D. C.

Cold Mix Plants

15. New catalogs and prices of Portable Bituminous Mixers in 6 to 14 ft. sizes for resurfacing and maintenance. Issued by The Jaeger Machine Co., 400 Dublin Ave., Columbus 16, Ohio.

Cold or Wet Weather Construction

18. Cleaver Aggregate Heaters and Dryers, Hot Water Boosters, and Automatic Steam plants are designed to speed up cold or wet weather construction. Write for illustrated bulletins. Cleaver-Brooks Co., 3112 W. Center St., Milwaukee, Wis.

Concrete Accelerators

31. New 48-page booklet in five sections explains clearly the effects, advantages and methods of using Calcium Chloride and Portland Cement mixes. Complete and packed with practical information; well illustrated; pocket size. Sent free on request by Solvay Sales Corp., 40 Rector St., New York, N. Y.

Concrete Curing

33. 64-page manual of concrete curing with calcium chlorides. Complete, handy. Contains useful tables, well illustrated. Write the Columbia Chemical Division, Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa.

Concrete, Early Strength

38. 64-page manual tells how to speed up year 'round concreting, shows how to secure high early strength and greater workability at temperatures either below or above freezing. Contains many actual examples of practical concreting operations; well illustrated with more than 60 photos, charts, graphs and tables. Calcium Chloride Assn., Penobscot Building, Detroit 26, Mich.

Concrete Mixers

44. Catalog and prices of Concrete Mixers, both Tilting and Non-Tilt types, from 3½S to 56S sizes. The Jaeger Machine Company, 400 Dublin Ave., Columbus 16, Ohio.

Drainage Products

70. Standard corrugated pipe, perforated pipe and MULTI PLATE pipe and arches — for culverts, sewers, subdrains, cattlepasses and other uses are described in a 48-page catalog entitled "ARMCO Drainage Products," issued by the Armco Drainage Products Association, Middletown, Ohio, and its associated member companies. Ask for Catalog No. 12.

Graders, Patrol

105. The Austin-Western 99M Power Grader with its powerful all wheel drive simplifies all construction and maintenance; handles difficult jobs with economy and efficiency; and does better work on grading, ditching, scarifying, snow plowing, loading, mixing, bulldozing, shoulder trenching and backsloping. Write for Bulletin 1946. Austin-Western Road Machinery Co., Aurora, Ill.

Mixing Plants, Asphalt

106. The Cleaver Asphalt Mixing Plant for an inexpensive plant mix and the Cleaver Tank Car Heater and Bituminous Booster are covered in illustrated catalogs sent on request by Cleaver-Brooks Co., 3112 W. Center St., Milwaukee, Wis.

Mud-Jack Method

107. How the Mud Jack Method for raising concrete curb, gutter, walls and street solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities — a new bulletin by Koehring Company, 3026 West Concordia Ave., Milwaukee, Wis.

Oil, Motor

109. "Here's Proof of Ring-Free Superiority," 32 pages, illustrated, outlines the principles of lubrication and explains how by simple tests you can measure the advantages of Macmillan Ring-Free Motor Oil. Write Macmillan Petroleum Corp., 530 West 6th St., Los Angeles, Calif.

Paving Materials, Bituminous

111. New "Tarvia Manual" is packed with useful data on how to build and maintain roads with Tarvia. Each step is illustrated with excellent action pictures, 64 pp. 103 ills. Write to The Barrett Div., 40 Rector St., New York, N. Y.

Pumps

120. Interesting new booklet tells how to lengthen the life of your pumps. Explains how a little care will save a lot of wear. Write today for your copy. Homelite Corp., 2403 Riverdale Ave., Portchester, N. Y.

121. New illustrated catalog and prices of Jaeger Sure Prime Pumps, 2" to 10" sizes, 7000 to 220,000 G.P.H. capacities, also Jetting, Caisson, Road Pumps, recently issued by The Jaeger Machine Company, 400 Dublin Ave., Columbus 16, Ohio.

123. New brochure by Gorman-Rupp Co., Mansfield, Ohio, illustrates and describes many of the pumps in their complete line. Covers heavy duty and standard duty self-priming centrifugals, jetting pumps, well point pumps, triplex road pumps and the lightweight pumps.

124. 16-page illustrated bulletin, SP-37, describes and illustrates complete C. H. & E. line of self-priming centrifugal pumps from ½" to 8", including lightweight models for easy portability. C. H. & E. Mfg. Co., 3841 No. Palmer St., Milwaukee, Wis.

Road Building and Maintenance

128. Motor Patrol Graders for road maintenance, road widening and road building, a complete line offering choice of weight, power, final drive and special equipment to exactly fit the job. Action pictures and full details are in catalogs Nos. 253, 254 & 255, issued by Galion Iron Works & Mfg. Co., Galion, Ohio.

129. Warco Hydraulic Control Motor Graders, Duplex Hydraulic Scoops and Whizzard, easily transported, rollers are described and illustrated in literature available from W. A. Riddell Corp., Bucyrus, Ohio.

Rock Drill Maintenance

130. New booklet presents through amusing cartoons useful hints on proper rock drill maintenance methods—what your men can do to get more work out of your tools with a minimum of expense for repairs and compressed air. Write The Cleveland Rock Drill Co., 3734 East 78th St., Cleveland, Ohio.

Rollers

133. New Tu-Ton roller of simple construction for use in rolling sidewalks along highways, playgrounds and other types of light rolling is fully described in a bulletin issued by C. H. & E. Mfg. Co., 3841 No. Palmer St., Milwaukee, Wis.

138. "The Buffalo-Springfield line of road rollers (tandem, 3-wheel, and 3-axle) are described in the latest catalog issued by the Buffalo-Springfield Roller Co., Springfield, Ohio."

139. "Ironeroller" 3 Axle Roller for extra smooth surfaces on all bituminous work. Booklet contains roller data and operation details. Hercules Co., Marion, Ohio.

140. This well-illustrated 16-page catalog describes the tandem, autocrat, cadet, and roll-a-plane rollers, and explains what each is intended to accomplish. Write Austin-Western Road Mach. Co., Aurora, Ill.

Rotproofing

145. Cuprinol, a rotproofing chemical that protects wood from fungi and insects, yet has no offensive odor, is non-poisonous, does not corrode metal and can be painted over. Get full details in booklet from Cuprinol, Inc., 7 Water St., Boston, Mass.

Soil Stabilization

150. "High-Service, Low Cost Roads" is one of the newer booklets using an effective combination of picture and text to set forth the principles and advantages of road surface stabilization with calcium chloride. Complete, interesting and well illustrated. 34 pages. Sent by Solvay Sales Corp., 40 Rector St., New York, N. Y.

152. The Columbia Chemical Division will be glad to furnish to anyone interested complete information dealing with Calcium Chloride Stabilized Roads. This literature contains many charts, tables and useful information and can be obtained by writing Columbia Chemical Div., Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa.

154. "Soil Stabilization with Tarvia"—An illustrated booklet describing the steps in the stabilization of roadway soil with Tarvia will be mailed on request by The Barrett Div., 40 Rector St., New York, N. Y.

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155. Sterling Rock Salt for Frost Damage Prevention. Sterling Rock Salt for Base and Surface Stabilization. Two descriptive bulletins issued by International Salt Co. Inc., Scranton, Pa.

Spreader

187. Jaeger Paving equipment, including Mix-in-Place Roadbuilders, Bituminous Pavers, Concrete Bituminous Finishers, Adjustable Spreaders, Forms, etc.—4 complete catalogs of latest equipment in one cover, issued by The Jaeger Machine Company, 400 Dublin Ave., Columbus 16, Ohio.

Surface Consolidation and Maintenance

188. Detailed and illustrated presentation of the method and procedure in consolidated operations; explains how sub-soils can be conditioned to resist softening and frost action; how surfacing can be consolidated to provide smooth all-weather riding surfaces; how they can be maintained so as to prevent disintegration and gravel loss. Write the Calcium Chloride Association, Penobscot Bldg., Detroit 26, Mich., for Bulletin No. 29.

Timber Structures

189. "Typical Designs of Timber Structures" contains plans for 45 representative structures that have been engineered with Teco Connectors. For free copy write Timber Engineering Co., Inc., Room 6GG, 1319—18th St., N. W., Washington, D. C.

Wellpoints

195. New complete catalog, "Griffin Pointed Wellpoint Facts," just issued. Covers pre-drainage, describing wellpoints jetting pumps, with tables, diagrams and illustrations. Griffin Wellpoint Corp., 881 E. 141st St., New York.

Street and Paving Maintenance

290. "Blacktop Road Maintenance and Construction Equipment" — Asphalt and tar kettles, flue type kettles, spray attachments with completely submerged pumps, tool heaters, surface heaters, road brooms, portable trail-o-rollers, etc. These are all described in detail and illustrated. This modern and up-to-date equipment for blacktop airport and road construction and maintenance is based upon experience and engineering research over a period of 42 years. Write for Catalog R. Littleford Bros., Inc., 452 East Pearl St., Cincinnati 2, O.

Fire Apparatus

300. Detailed information and advice about specially engineered Ward LaFrance apparatus will be sent on request. Ward LaFrance Div., Elmira, N. Y.

Snow Fighting

Snow Plows

350. "Frink One-Way Sno-Plows" is a four page catalog illustrating and describing 5 models of One-Way Blade Type Sno-Plows for motor trucks from 1½ up to 8 tons capacity. Interchangeable with V Sno-Plow. Features, specifications and method of attaching. Carl H. Frink, Mfr., Clayton, 1000 Islands, N. Y.

Ice Control

351. "Make Icy Highways Safe for Traffic"—a new bulletin by Michigan Alkali Div., Wyandotte Chemicals Corp., Wyandotte, Mich., tells how to use calcium chloride for modern ice control.

352. Ice Prevention on Highways, Streets, and Airport Runways with Sterling "Auger Action" Rock Salt. An illustrated bulletin issued by International Salt Co. Inc., Scranton, Pa.

Sanitary Engineering

Aero-Filter

356. "Results Produced by Aero-Filters" is a new pamphlet covering results at Temple, Texas; Paris, Ill.; Webster City, Iowa; and Mason, Mich. Write Lakeside Engineering Corp., 222 West Adams St., Chicago, Ill.

Air Release Valves

357. Automatic Air Release Valves for water, sewage and industrial uses are described and illustrated in new catalog issued by Simplex Valve & Meter Co., 6750 Upland St., Philadelphia, Pa.

Analysis of Water

360. "Methods of Analyzing Water for Municipal and Industrial Use" is an excellent 94 page booklet with many useful tables and formulas. Sent on request by Solvay Sales Corp., 40 Rector St., New York, N. Y.

Activation and Aeration

367. A valuable booklet on porous diffuser plates and tubes for sewage treatment plants. Covers permeability, porosity, pore size and pressure loss data, with curves. Also information on installations, with sketches and pictures, specifications, methods of cleaning and studies in permeability. 20 pp. illustrated. Sent on request to Norton Company, Worcester, Mass.

Blowers

370. All interested in low cost air for sewage disposal will want a copy of this catalog describing operating principles and specifications of Roots-Connersville Aerating Blowers. Write to Roots-Connersville Blower Corp., 301 Valley Ave., Connersville, Ind.

Brine-Making Equipment

378. The Lixate Process for Making Brine. A 36-page fully-illustrated booklet on the Lixate Process for making brine. It gives all the facts—installations, brine tables, diagrams, formulas.—International Salt Co. Inc., Scranton, Pa.

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379. Complete data on new portable chlorinator designed to meet emergency calls quickly and efficiently. Write Wallace & Tiernan Co., Inc., Newark 1, N. J.

380. "Emergency Sterilization Equipment," a new bulletin describing the advantages of Dual Drive Chlor-O-Feeders which can serve as either a permanent chemical feeder or as a portable emergency chlorinator. Order from Proportioneers, Inc., 96 Codding St., Providence, R. I.

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386. New circular describes and illustrates the Var-I-Feeder, a new portable chemical feeder for water main sterilization, military use or other chemical treatment. Write Chem-Feeds, Inc., 77 Reservoir Ave., Providence, R. I.

387. Everson Sterelators for all kinds of chemical feeding in stationary and portable models are described in new bulletins issued by Everson Manufacturing Co., 214 West Huron St., Chicago 1, Ill.

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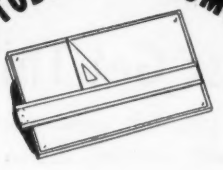

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394. Gate, flap and check valves; floor stands and fittings. New catalog No. 34 gives detail information with dimensions for all types of new full line. M. & H. Valve & Fittings Co., Anniston, Ala.

395. Complete booklet with much worthwhile water works data describes fully Ludlow hydrants and valves. Sent on request. Ludlow Valve Mfg. Co., Troy, N. Y.

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403. pH and Chlorine Control. A discussion of pH control and description of comparators, chlorimeters and similar devices. An 80-page booklet. W. A. Taylor & Co., 7301 York Road, Baltimore, Md.

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404. "The Lubriplate Way" contains much valuable information on long-lasting Lubriplate lubricants which are especially adapted for difficult conditions such as parts that are immersed in sewage, water or steam. Write Lubriplate Division of Fiske Brothers Refining Co., 129 Lockwood St., Newark, N. J.

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405. Street, sewer and water castings in various styles, sizes and weights. Manhole covers, water meter covers, adjustable curb inlets, gutter crossing plates, valve and lamphole covers, ventilators, etc. Described in catalog issued by South Bend Foundry Co., Lafayette Boul. and Indiana Ave., South Bend, Ind.

Manhole Covers and Frames, Concrete

406. Detailed descriptive folder, with specifications, issued by United Concrete Form Products Co. Inc., 101 Park Ave., New York 17, N. Y.

Meters, Venturi

407. New bulletin illustrates Builders Air Relay system of transmission for the Venturi Meter which is particularly useful for liquids containing suspended solids like sewage. Eliminates corroson, clogged pipes, etc. Write Builders-Providence, Inc., Codding St., Providence, R. I.

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409. Handbook of Universal Cast Iron Pipe and Fittings, pocket size, 104 pages, illustrated, including 14 pages of useful reference tables and data. Sent by The Central Foundry Co., 386 Fourth Ave., New York 16, New York.

410. Cast iron pipe and fittings for water, gas, sewer and industrial service. Super-deLavaud centrifugally-cast and pit-cast pipe. Bell-and-spigot, U. S. Joint, flanged or flexible joints can be furnished to suit requirements. Write U. S. Pipe and Foundry Co., Burlington, N. J.

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412. Lock Joint Reinforced Concrete Sewer Pipe. Pressure Pipe, Culvert Pipe, Centrifugal Pipe and Subaqueous Pipe is described and illustrated in bulletins available from Lock Joint Pipe Co., Ampere, N. J.

Pipe, Transite

414. Two new illustrated booklets "Transite Pressure Pipe" and "Transite Sewer Pipe" deal with methods of cutting costs of installation and maintenance of pipe lines and summarize advantages resulting from use of Transite pipes. Sent promptly by Johns-Manville Corp., 22 East 40th St., New York, N. Y.

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Pipe, 2-inch Cast Iron

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Pipe Joint Compounds

418. The uses of Tegul-Mineralead for bell and spigot pipe and G-K Sewer joint compound are described in a 16-page illustrated booklet issued by Atlas Mineral Products Co., Mertztown, Pa. Includes useful tables for estimating quantities needed.

Pumps and Well Water Systems

420. Installation views and sectional scenes on Layne Vertical Centrifugal and Vertical Turbine Pumps fully illustrated and including useful engineering data section. Layne Shutter Screens for Gravel Wall Wells. Write for descriptive booklets. Advertising Dept., Layne & Bowler, Inc., Box 186, Hollywood Station, Memphis, Tenn.

Pumps, Turbine

422. Oil lubricated turbine pumps with open impellers. Five types of heads available. Specifications and illustrations in new bulletin 6930M-2 issued by Fairbanks, Morse & Co., 600 So. Michigan Ave., Chicago, Ill.

Meter Setting and Testing

430. The most complete catalog we have seen on setting and testing equipment for water meters—exquisitely printed and illustrated 48-page booklet you should have a copy of. Ask Ford Meter Box Co., Wabash, Ind.

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434. Be assured of uninterrupted, constant automatic removal of screenings. Folder 1587 tells how. Gives some of the outstanding advantages of "Straightline Bar Screens" (Vertical and Inclined types). Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.

Sludge Drying and Incineration

440. "Disposal of Municipal Refuse." Complete specifications and description including suggested form of proposal; form of guarantees; statements and approval sheet for comparing bids with diagramatic outline of various plant designs. 48 pages. Address: Morse Boulger Destructor Co., 216-P East 45th St., New York 17, N. Y.

442. Recuperator tubes made from Silicon Carbide and "Fireclay" Corebusters for maximum efficiency are described and illustrated in bulletin No. 11 issued by Fitch Recuperator Co., Plainfield National Bank Bldg., Plainfield, N. J.

443. Nichols Herreshoff incinerator for complete disposal of sewage solids and industrial wastes—a new booklet illustrates and explains how this Nichols incinerator works. Pictures recent installations. Write Nichols Engineering and Research Corp., 60 Wall Tower, New York, N. Y.

Softening

444. This folder explains the process of Zeolite water softening and describes and illustrates the full line of equipment for that purpose made by the Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago, Ill. Includes flow charts, tables and other valuable data. Write for a copy of this instructive folder.

445. Water Softening. The use of the Spaulding Precipitator to obtain maximum efficiency and economy in water softening is described in a technical booklet. Permutit Co., 330 W. 42nd St., New York 18, N. Y.

Sprinkling Filters

447. Design data on sprinkling filters of Separate Nozzle Field and Common Nozzle Field design as well as complete data on single and twin dosing tanks, and the various siphons used in them, for apportioning sewage to nozzles. Many time-saving charts and tables. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago 13, Ill.

Swimming Pools

448. Data and complete information on swimming pool filters and recirculation plants; also on water filters and filtration equipment. For data prices, plans, etc., write Roberts Filter Mfg. Co., 440 Columbia Ave., Darby, Pa.

Taste and Odor Control

449. "Taste and Odor Control in Water Purification" is an excellent 92-page, illustrated booklet covering sources of taste and odor pollution in water supplies and outlining the various methods of treatment now in use. Every water works department should have a copy. Write Industrial Chemical Sales Div., 230 Park Ave., New York, N. Y.

450. Technical pub. No. 207 issued by Wallace & Tiernan Co., Inc., Newark 1, N. J., describes in detail taste and odor control of water with BREAK-POINT Chlorination, a method of discovering the point at which many causes of taste may be removed by chlorination with little or no increase in residual chlorine. Sent free to any operator requesting it.

Treatment

452. Three types of clarifiers for sewage treatment are illustrated and described in a new bulletin issued by Graver Tank & Mfg. Co., 332 South Michigan Ave., Chicago, Ill.

453. "Safe Sanitation for a Nation," an interesting booklet containing thumbnail descriptions of the different pieces of P.F.T. equipment for sewage treatment. Includes photos of various installations and complete list of literature available from this company. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago 13, Ill.

454. All-steel Rotary Distributors, correctly designed for the small and medium sized sewage plants, are the subject of a new, well illustrated booklet issued by Graver Tank & Mfg. Co., 332 South Michigan Ave., Chicago, Ill. This booklet also covers distributors for various types of high-rate trickling filters.

455. New booklet (No. 1642 on Link-Belt Circuline Collectors for Settling Tanks contains excellent pictures; drawings of installations, sanitary engineering data and design details. Link-Belt Company, 2045 W. Hunting Park Ave., Philadelphia.

456. New 16-page illustrated catalog No. 1742 on Straightline Collectors for the efficient, continuous removal of sludge from rectangular tanks at sewerage and water plants. Contains layout drawings, installation pictures, and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia, Pa.

457. New illustrated folder (1942) on Straightline apparatus for the removal and washing of grit and detritus from rectangular grit chambers. Address: Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.

458. "Sedimentation with Dorr Clarifiers" is a complete 36-page illustrated catalog with useful design data. Ask The Dorr Company. 570 Lexington Ave., New York 22, N. Y.

459. A combination mechanical clarifier and mechanical digester, The Dorr Clarigester, is expiained and illustrated in a bulletin issued by The Dorr Company, 570 Lexington Ave., New York 22, N. Y.

461. Preflocculation without chemicals with the Dorrco Clariflocculator in a single structure is the subject of a new booklet issued by The Dorr Company, 570 Lexington Ave., New York 22, N. Y.

462. Dorrco Monorake for existing rectangular sedimentation tanks, open or closed, is described and illustrated in a new catalog sent on request. The Dorr Co., 570 Lexington Ave., New York 22, N. Y.

465. The complete line of Jeffrey equipment for water, sewage and industrial wastes treatment is illustrated and described in a handsome, new, 40-page catalog just issued by The Jeffrey Mfg. Co., 947-99 North Fourth St., Columbus 16, Ohio.

466. Flocculation with Floctrols. For details on controlled flocculation, tapered mixing, practical elimination of short circuiting, rapid settling of properly flocculated solds write for Catalog No. 703-A. Jeffrey Mfg. Co., 948-99 No. Fourth St., Columbus, Ohio.

Underdrains, Trickling Filter

468. Illustrated bulletin describes the Natco Unifilter block of glazed, hard burned clay for underdraining filter beds. Write National Fireproofing Corp., Pittsburgh, Pa., for free copy.

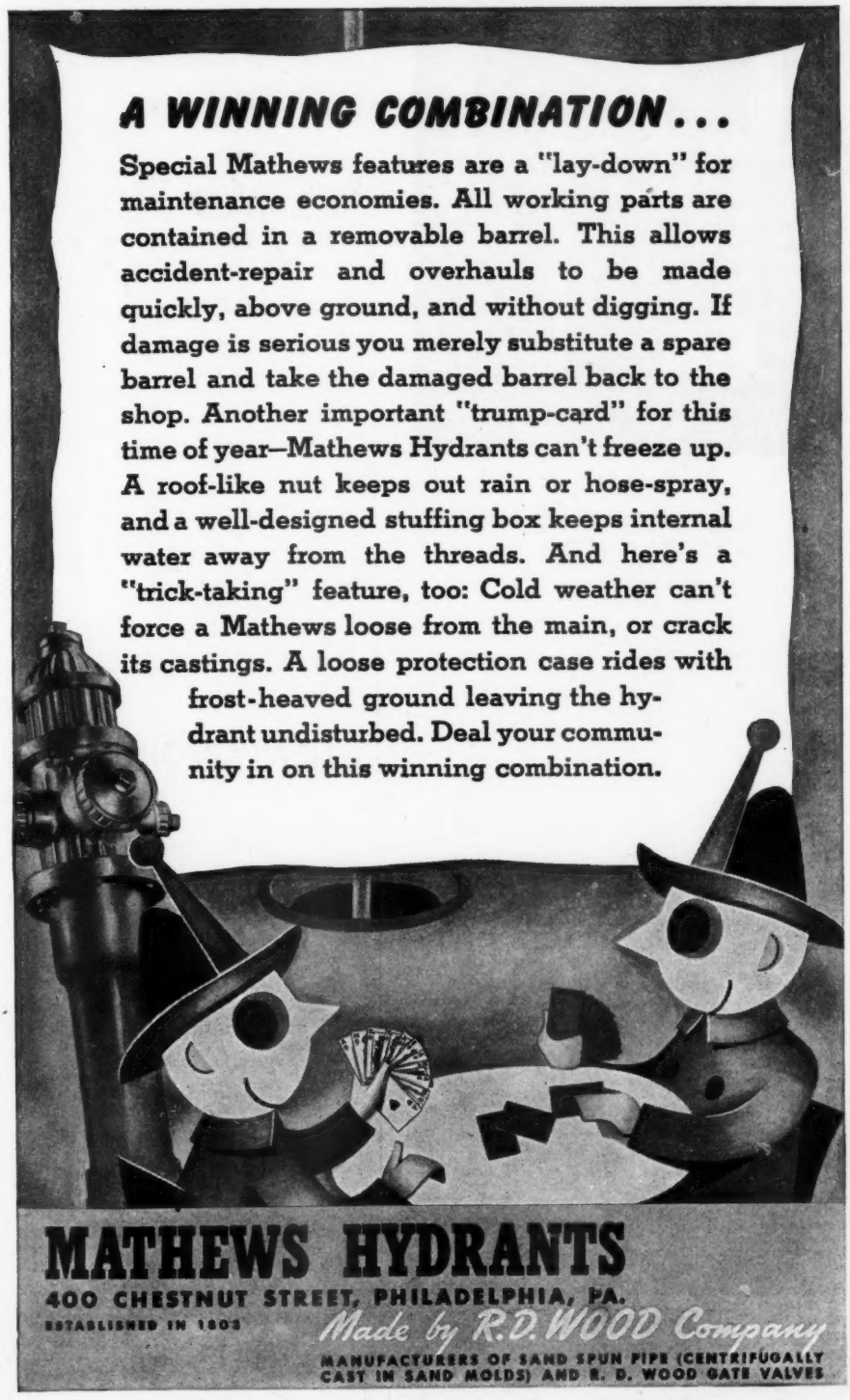
Valves (See Gates, Air Release, etc.)

Water Treatment

470. If you have a water conditioning problem of any kind, write Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago, Ill., who manufacture all types of conditioning equipment and will be pleased to make recommendations.

Water Service Devices

500. Data on anti-freeze outdoor drinking fountains, hydrants, street washers, etc., will be sent promptly on request to Murdock Mfg. & Supply Co., 426 Plum St., Cincinnati, Ohio.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ESTABLISHED IN 1803
Made by R.D.WOOD Company
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MURDOCK SINCE 1833

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933.

OF PUBLIC WORKS, published monthly at New York, N. Y., for October 1, 1943.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Croxton Morris, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the PUBLIC WORKS and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Public Works Journal Corp., 310 East 45th St., New York 17, N. Y.; editor, A. Prescott Folwell, 310 East 45th St., New York 17, N. Y.; managing editor, none; business manager, Croxton Morris, 310 East 45th St., New York 17, N. Y.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

Public Works Journal Corp., J. T. Morris, Croxton Morris, A. Prescott Folwell and Anna Morris, all of 310 East 45th St., New York 17, N. Y.; W. A. Hardenbergh, Washington, D. C.; Wesley Hardenbergh, Golf, Ill., and S. N. Hume, address unknown.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) Bertha Morris, White Plains, N. Y.; Mary Sunderland, Liberty, N. Y.; Estate of Elizabeth Hardenbergh, White Sulphur Springs, N. Y.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation from whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is (This information is required from daily publications only.)

CROXTON MORRIS, Business Manager.

Sworn to and subscribed before me this 24th day of September, 1943.

[Seal] CULLEN B. HARDY
Notary Public, Westchester County, N. Y.
Cert. filed in N. Y. Co. No. 876
My commission expires March 30, 1944.

Personal Notes

Arthur C. Rerick Dies

Arthur C. Rerick, aged 50, Vice-President of E. D. Etnyre & Co. of Oregon, Illinois, died at his home in South Bend, Indiana, on the morning of September 30, following a six months' illness.

Often called the "Colonel," Mr. Rerick was well-known throughout the road-building industry as the factory representative of his company.

In his position as an executive with the "House of Etnyre," he worked with dealer organizations throughout the nation to help promote the sales of Etnyre equipment.

At the time of his death, he was on leave of absence from his company to help in the war effort as a member of the Highway Machinery Division of the War Production Board.

Stuart J. Saks, President, Morris Machine Works, Baldwinsville, N. Y,. Passed Away on Sunday, September 5, 1943

Mr. Saks, who was 52, was stricken at his summer home at Mexico Point and taken to the hospital by ambulance Saturday night.

Following World War I, Mr. Saks was in newspaper work for a time and served with International News Service in New York and The Associated Press in Pittsburgh. He then turned to manufacturing and had executive positions with several companies before he joined the Baldwinsville company about three years ago.

Mr. Saks was made president of the Morris company two years ago, directing it in increasing activities as it became busy with war work.

NEW APPOINTMENTS

New city and county officials recently reported:

City Engineers

R. M. Douglass, McKeesport, Pa.

City Managers

Sherrill P. Nelson, Grand Haven, Mich.
Walter H. Sack, Grand Rapids, Mich.
Clayton Conrad, Three Rivers, Mass.
G. E. Horne, Tecumseh, Okla.
K. B. Tanver, Eastland, Tex.
R. David Maber, Jr., Blackstone, Va.
F. R. Billchner, Superior, Wisc.

County Engineers and Officials

C. E. Chubb, Kossuth Co., Algona, Ia.
Claude Hamilton (Acting) Montgomery Co., Glenwood, Ia.
T. R. Day, Hubbard Co., Crookston, Minn.
Albert J. Opperman, Fayette Co., Uniontown, Pa.

Water Works Superintendents

Walter A. Ford, Cortland, N. Y.
F. J. Padgett, Asheville, N. C.
Jack Gordon, Rochester, Indiana

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